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Contents

Dominika Stryjewska, Krzysztof Kwoka,
Paulina Szymanowska, Bożena Janda-Dębek

CogMap Analyst – a quantitative analysis of the structure and content characteristics of sketch drawings of cognitive maps of urbanized spaces 9

Jakub Traczyk, Jakub Kus, Agata Sobkow

Affective response to a lottery prize moderates processing of payoffs and probabilities: An eye-tracking study 35

Katarzyna Wojtkowska, Nina Andersz, Joanna Czarnota-Bojarska

Adapting The Survey Of Perceived Organizational Support..... 47

Iwona Krzewska, Grażyna Dolińska-Zygmunt

The sense of body boundaries – subjective determinants and implications for body self-relation in people with psychosomatic illnesses 59

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CogMap Analyst – a quantitative analysis of the structure and content characteristics of sketch drawings of cognitive maps of urbanized spaces

Abstract

The paper presents the specification of the CogMap Analyst program, which has been created for the purpose of conducting an analysis of the structure and content of sketch drawings of cognitive maps of urbanized spaces. Assumptions for this analytic tool come from the neobehavioral understanding of the concept of cognitive maps, which has its source in the works of Tolman, and from the criteria of analyzing their contents and structure, which were developed by Lynch (1960). The program serves the purpose of collecting numerical data on the quantity, size, as well as placement and distortion of objects on drawings by participants in relation to the actual layout of the terrain, which was selected by the researcher, and to the sketch's scale. This data may be used not only to determine the measurements on drawings, but also to determine possible connections with other variables, such as personal traits of participants and formal traits of the space, according to the research goals of particular scientific studies for which the CogMap Analyst program shall be used. In this article we present the theoretical basis for the tool that we have created, we compare its characteristics with

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other similar methods of quantitative analysis of sketch drawings of cognitive maps, and we present in detail the mode of operation and of data analysis employed by CogMap Analyst.

Keywords

cognitive maps, sketch maps, LabView, quantitative analysis

Streszczenie

Niniejszy artykuł przedstawia charakterystykę programu CogMapAnalyst stworzonego na potrzeby dokonywania strukturalnej i treściowej analizy rysunków szkicowych map poznawczych przestrzeni zurbanizowanych. Założenia tego narzędzia analitycznego opierają się na neobehawiorystycznym rozumieniu konceptu map poznawczych wywodzącym się z prac Tolmana (1948) oraz kryteriach ich analizy treściowej i strukturalnej wypracowanych przez Lyncha (1960). Program umożliwia zebranie danych liczbowych odnoście liczby, rozmiaru oraz rozmieszczenia i zniekształceń obiektów na rysunkach badanych w odniesieniu do rzeczywistego planu terenu, a także zastosowanej przez badanego skali jego szkicu. Dane te mogą zostać wykorzystane nie tylko do określenia charakterystyk metrycznych rysunków, ale także do porównań z innymi zmiennymi, np. podmiotowymi badanych i formalnymi przestrzeni, w zależności od celów badawczych konkretnych studiów naukowych, do których program CogMap Analyst będzie wykorzystywany. W tym artykule prezentujemy podstawy teoretyczne stworzonego przez nas narzędzia, porównujemy jego charakterystykę z innymi podobnymi metodami analizy ilościowej rysunków szkicowych map poznawczych oraz przedstawiamy dokładnie sposób działania i analizy danych wykorzystywany przez CogMap Analyst.

Słowa kluczowe

Mapy poznawcze, mapy szkicowe, LabView, analiza ilościowa

1. Introduction

One of the main areas of research in environmental psychology, since the beginning of this scientific discipline's existence, has been the search for the mode by which people perceive and memorize space (Stokolos, 1978). These inquiries are part of the analysis of perception and cognition (Rovine and Weisman, 1989), and they categorize the mental representation of space created in a human mind as a so-called cognitive map. This type of cognitive representations is characterized by a strong variability in different groups and types of people (this matter has been more widely discussed by pioneers in the field, Downs and Stea (1973)). Thus the question of measuring and analysing cognitive maps is a topic not only for geography or urban planning, but also for psychology (cognitive and environmental psychology, as well as neuropsychology).

1.1. Characteristics of cognitive maps

In the broadest terms, a cognitive map can be defined as a personal representation of space and the objects within it, including all internal processes that enable: the acquisition and ma-

nipulation of information about the nature of the spatial environment (Kara, 2013), as well as the coding of symbolic aspects of the environment (Pinheiro, 1998). In other words: it is an individual, personalized reflection of what and how is perceived by a person, as well as what is used for planning and taking certain action in a particular spatial situation. Thus, as logically follows from the above definition, a cognitive map is not a map as understood in geography. Its purpose is not to precisely represent the measures of distance or angles according to Euclidean geometry (which is the main purpose of cartographical maps) (Buttenfield, 1986; Tversy, 1993). Cognitive maps are full of errors, deviations from actual measurements, omissions of many objects, and are linked to simplifications of meanings of objects (Pinheiro, 1998), combining them into patterns and configurations, which are meant to lighten the load on working memory and limit the use of cognitive resources. A simplified, incomplete, and imprecise scheme is meant only to provide data that are necessary for effective navigation, according to the preferences of the individual (Montello, 1992). Cognitive structuring enables organizing the world in a recognizable and manageable manner.

Unfortunately, cognitive representations cannot be analysed explicitly. We do not know what elements comprise a memorized image (verbal, numerical, or pictographic), and it cannot be precisely verified (Buttenfield, 1986). Thus, "third-hand products" are analysed – indirect expressions of knowledge about a space. In over seventy years of research into cognitive maps, numerous, diverse, and often innovative methodologies were developed, meant to enable the analysis of representations of varied areas in different groups and types of people (Downs and Stea, 1973). For the purposes of scientific studies of different aspects of cognitive maps, scientists have created a wide variety of tools designed to measure mental representations, differing as a consequence of the adopted research problems. The most common research tasks include analysing sketch maps of certain areas drawn by people, locating points on a base map, estimating the distance or direction between series of locations, and many more, in relation to real as well as virtual spaces, familiar or previously unknown to the research participants (e.g. Kitchin, 1996; Bors and Vigneau, 2011; Chaney, 2010; Foo, Warren, Duchon and Tarr, 2005; Tu Huynh and Doherty, 2007; Appleyard, 1970). Analysing yielded results was difficult, however, due to the specific nature of the gathered data, especially as regards sketch cognitive maps. In order to compare individual sketch drawings, to categorize them, certain methods are required that give a chance of making the data objective. And so the original sketch map analysis program, CogMap Analyst, was created, which shall be described in the further subsections of this paper.

1.2. Sketch drawing as a method of analysing cognitive maps

One of the classic methods of analysing cognitive maps is the sketch drawing method. Drawing is a natural way of expressing, sharing, storing, and creating knowledge (Ep-

pler and Pfister, 2011). It is one of the most primal forms of representing mental images (Tversky, 2002). Drawing was a widely used method of communication long before the emergence of formal types of writing, as evidenced by, for instance, cave paintings. Furthermore, drawing a map of terrain is one of the most widely spread and most often used methods of representing space in most cultures (Hurtowicz and Adler, 1911). When we draw a simplified sketch map of a given area, we are able to convey not only spatial relations between individual objects, but also convey semantic meanings, which are based in the cultural and personal conditions of the drawer (this topic will be discussed more widely in further sections of the article).

1.2.1. Methodology of analysing the structure and content of sketch drawings

Despite its naturalness, this method of investigating cognitive maps through analysing sketch drawings creates considerable difficulties in conducting reliable analysis. This is because the mode of representing spaces is very much individualized, hard to study in a quantitative manner, as opposed to purely qualitative approaches. Through the decades of research into cognitive maps many different methodologies of analysing sketch maps have been developed (Downs and Stea, 1973). When investigating differences in cognitive maps in different groups and types of people it is important to assume that the structure of a sketch drawing of a cognitive map is connected to the process of reproducing the effects of memorizing information about a space on a sheet of paper, and that it is not formed randomly in the reporting phase (Buttenfield, 1986).

In 1960 one of the most important books on the matter of sketch drawings of cognitive maps has been published, Kevin Lynch's "The Image of the City". It put forth an innovative method of analysing sketch drawings of cognitive maps of urbanized spaces. It became the starting point for an analysis of sketch drawings in most of future studies (e.g. Banerjee et al., 1977; Cadwallader, 1976, 1979; Day, 1976; Lloyd and Heivly, 1987; Wong, 1979). The characteristics of sketch maps distinguished by Lynch are related to elements of their content – objects that appear on the map, and to elements of their structure, related to themetric properties of the objects (size and location in a given area).

1.2.1.1. Components of (the content of) a sketch map

Lynch distinguished five basic types of objects appearing on maps – landmarks, paths, edges, nodes, and districts.

Paths are just roads that, at least potentially, enable movement. They include streets, sidewalks, passages, canals and transit lines. Edges are linear elements of the landscape, which are not considered paths by users. They are boundaries of a sort, separating or connecting parts of the city. Their essence is the breaking of some kind of continuity. They can include river banks, sea or lake shores, moats and walls. The next element is districts, meaning medium-sized parts of cities which have some recognizable characteristic traits,

which distinguish them from others. This gives the observer a mental sense of entering a district. The next kind of elements of cognitive maps is nodes. On the city scale these can be intersections, railway or communication nodes, squares, street corners. These places often gather large number of people and/or functions, and are characterized by their outward traits or by the functions that they fulfil. Landmarks are orientation points. Most of the time they are physical objects that are easily recognizable because of their outward characteristics (Lynch, 1960). They can be large objects (skyscrapers, mountains), distant or proximal, standing out in the surrounding space (monuments, memorials, fountains), adding expressiveness to the space (signs, shop signboards, atypical building facades). Landmarks are, therefore, objects with characteristic, easily spottable, and distinctive traits. Thus, objects in space that are related to decision making points in navigation (e.g. when to make a turn) become landmarks for the user (Arnold et al., 2013).

1.2.1.2. Structural elements of a sketch map

Based on the analysis of drawings of sketch maps yielded by study participants, Lynch distinguished categories of errors that occur most often. These errors are not related to the structure of the cognitive map. Rather, they spring from the specific nature of human cognitive processes, or are related to the personal conditions of the specific person, or to the formal characteristics of the space (for a review see: Stryjewska and Janda-Dębek, 2013), and they will be analysed further as such. The most often occurring types of errors described by Lynch (1960) include: *incompleteness, distortions,* and *expansions*.

Errors of incompleteness are omissions of certain elements of the environment – from small details, up to large and significant fragments. They may appear for different reasons, and may be related to ignorance of a given space, to ignoring elements that are unimportant to the observer or just disliked by him (Lewicka and Bańka, 2008). Errors of distortion of the actual image are related to the distances between elements and their relative, erroneous, placement in space. The third group of errors is expansions. As understood by Lynch, these are added elements, which do not appear in a given space in reality. This is caused by interference from earlier experiences and the contents of existing cognitive schema. Elements that are characteristic to a given schema are included in the image even if they do not appear in a particular exemplification of it. This phenomenon is called *default structuring*, and may often facilitate spatial orientation (Bell et al., 2004).

The errors described above are not accidental nor are they are purely a result of observer's ignorance. Rather, they appear to emerge as a consequence of the nature of human perceptual an cognitive processes. The number of errors that inevitably appear due to this nature may be reduced by local specific sensorimotor feedback (performing a specific action), as well as by local environmental cues (Tversky, 2003). Mechanisms that cause the errors are multicausal, and undoubtedly very beneficial for adaptation. Naviga-

tion based on schema of cognitive representation is, in most cases, adequate and effective (Tversky, 2003), as well as parsimonious with the use of cognitive resources.

1.3. Other characteristics of sketch drawings of cognitive maps of urbanized spaces

As we have mentioned before, the image of cognitive maps of urbanized spaces is formed subjectively in the mind of every human as a result of interaction between perceived external environment with the individual conditions of a given person. According to Appleyard (1970), the creation of a cognitive representation (including a cognitive map) is related to the domination of one of the modes of perception, distinguished by the functions they fulfil: (a) *operational* – related to carrying out concrete tasks; (b) *communicational* – related to passive reception of signals and symbols; or (c) *interferential* – related to analysing and comparing perceived objects with prototypes that were seen earlier.

Based on this division, Huynh et al. (2008) distinguished three types of organization and structuring of elements of cognitive maps: *sequential*, *spatial,* and *hybrid*. The distinguished types of cognitive maps are related to the differentiation in the process of prioritization and grouping of elements of space. Each level of organization reflects a subjectively felt level of significance of particular elements (Banai, 1999; per: Huynh et al., 2008). The sequential model emphasizes the importance of elements related to the communication network (roads-links) and the borders that it created between each area, as well as the framework for placement of other objects. The spatial model is based on the priority of the identification of points in space that are important for the observer (landmarks), the third model combines the features of both (Stryjewska and Janda-Dębek, 2013).

Like with other structures of knowledge, attitudes affect the way of processing information about objects to which they pertain (Wojciszke, 2002), and are related to (a) selectiveness in seeking information (we seek information concordant with our attitude (Frey, 1986)), (b) tendentiousness of perceptions and conclusions (data and information from the environment are interpreted, and conclusions concordant with our attitude towards an object are drawn based on that (Wojciszke, 1980)), and (c) selectiveness of memory (we remember facts concordant with our attitude, and we remember more information about objects toward which we have a positive attitude).

Attitudes and personal engagement (e.g. emotional engagement) affect the image of cognitive maps in relation to estimations of distance and size between particular objects, among other things. Eckman and Bratfisch (1965) were the first to present results pointing to a link between emotional disposition and subjective distance to an object. This was confirmed by later research, showing that attitudes may be linked to selective deformations (e.g. distances to countries towards which the participants held negative attitudes were overestimated in studies (Carbon and Hesslinger, 2013)).

Some landmarks, like a person's home or workplace, also become anchoring points for individual images of cognitive maps. Each user of a space uses some objects as subjective landmarks. These may be places that are important due to personal experiences or are related to the values of a social group of which a given person is a member. Their influence on learning and recalling spatial locations is just as strong as that of physical landmarks. Some traits of the physical environment are more important to a particular person or stand out in some other way, and thus are more likely to be remembered (Bell et al., 2004). People also remember more objects that have characteristics that interest them, e.g. restaurants or shops with particular stock in offer (Lynch, 1960), according to their interests. This is why, in the course of analyses of content and structure of cognitive maps of urbanized spaces, it is important to determine the affective component of the participant's attitude towards a particular area, as it is a significant information about a potential reason for the appearance of a given kind of distortions.

Apart from the properties of sketch maps flowing from personal traits of the participants, it is also important to realize that formal qualities of the space have a significant effect on the remembered image of a given environment. Legibility is one of the most important qualities of this kind. According to Lynch's (1960) definition, legibility is a quality of an environment that causes its parts to be easily recognized and organized by the user into a coherent pattern. A legible environment implies that it is easy to learn and memorize its structure, which in turn facilitates navigation. Legibility may also affect emotional reactions, and make the space seem more aesthetic and attractive (Bell et al., 2003). In other words: a city is legible when it is easy to create a cognitive representation of it, and to find one's way around it (Lewicka and Bańka, 2008). According to Lynch, a legible space (or a well-designed space, from the perspective of an urban planner) is easy to remember thanks to well-known objects (symbols) in it, as well as widely known and available roads (Hauziński, 1998). This is why, when constructing the CogMap Analyst program, we have thought it important to include the possibility to gather data on legibility or illegibility of given areas among its functions.

1.4. Methods of analysing of sketch maps

In the last years scientists have developed different, analogue and computerized, methods of objectively measuring characteristics of sketch drawings of cognitive maps. Below we shall mention a few of them, whose theoretical assumptions and scope of analysed data is closest to our approach.

Montello and Ishikawa (2006) have compared the sketch drawings yielded by participants in their research to a cartographical map of the analysed area based on six points chosen by them (4 landmarks and 2 nodes). After doing the necessary scaling and rotation

of sketches, they superimposed their image on a cartographical underlay in such a way as to make the marked objects overlap as much as possible. Next they used bidimenstional coeYcient correlation, which yields information about the level of similarity between two maps on a scale of 0 to 1 (the higher the number, the stronger the similarity). To analyse the correlation of distances they have used Fisher's r-to-z transformation.

Imani and Tabaeian (2012) have used a very classic procedure in their research, which consisted of: (a) counting the landmarks, paths, and nodes presented on the sketches (contents of map); (b) counting the correct reproductions of connections between paths (analysis of map complexity); (c) analysis of correctness of placement of 8 landmarks on the sketch in relation to a cartographic map.

The CogSketch program, developed by Forbus' research team (Forbus et al., 2003; Forbus et al., 2008) is a system that is meant to analyse the structure of sketch drawings. It can be used for modelling spatial inference. Spatial abilities and learning spaces by participants are tested by analysing drawings with respect to different aspects, such as: the employed spatial language, spatial representations, and analogies. CogSketch uses qualitative topological and orientation relations presented on a sketch drawing to describe relations between the drawn elements.

Spatial Scene Similarity authored by Nedas (2006) and Nedas and Egenhofer (2008) offers using measurements of similarity between two images (e.g. maps) to compare them. Analyses are conducted for (a) similarity between objects on two images, (b) similarity between binary relations between objects marked on two images, (c) proportions of the total number of objects on both images to the number of objects that were matched on both images, and those that remained unmatched. Determination of the degree to which the images (maps) match is reached by searching for all possible associations between images and choosing the set of associations that gives the highest similarity.

In contrast to the methods described above, the CogMap Analyst program created by us enables a complex analysis of sketch cognitive maps. It makes it possible to count elements placed on a map independently from analysing numerical data, so it yields additional information from the same map. Acquisition of data on the placement and size of objects in relation to both the underlying map (a cartographic map of the studied area), and in relation to the particular distortions of regions on the sketch drawing allows for a wider view on the subject of the structure of mental maps.

The program, due to its method of detecting elements, also enables the analysis of those that were marked in an abstract manner (e.g. by placing a three-dimensional presentation of a building on the sketch). Additionally, due to the researcher's participation in the acquisition of data, it is possible to determine the location of erroneously sketched areas, even in a situation where objects' places are switched or where their orientation or shapes are

changed. Systems of automatic acquisition of data simplify the researcher's work, however we must note that they require an adequate amount of information in order to conduct analysis. In other words: systems that automatically analyse sketches or that are based only on algorithms of relations between arbitrarily defined objects make it necessary to acquire drawings from the participants that have a predefined level of accuracy and detail; other sketches must be rejected due to insufficient data. Because we approach each sketch map individually, we can omit this problem and extract full information about the entire studied group, and not only relatively standardized maps. Moreover, CogMap Analyst enables the collection of data about any type of elements appearing on sketches, including when the entire space on the drawing is distorted. Analysing each object separately, and grouping them according to their position in areas, allows for a detailed look at each fragment of the sketch map and detecting distortions related to a single element, and not only determining the similarity of a sketch to the original plan as a whole.

2. Description of the CogMap Analyst program

2.1. Theoretical assumptions

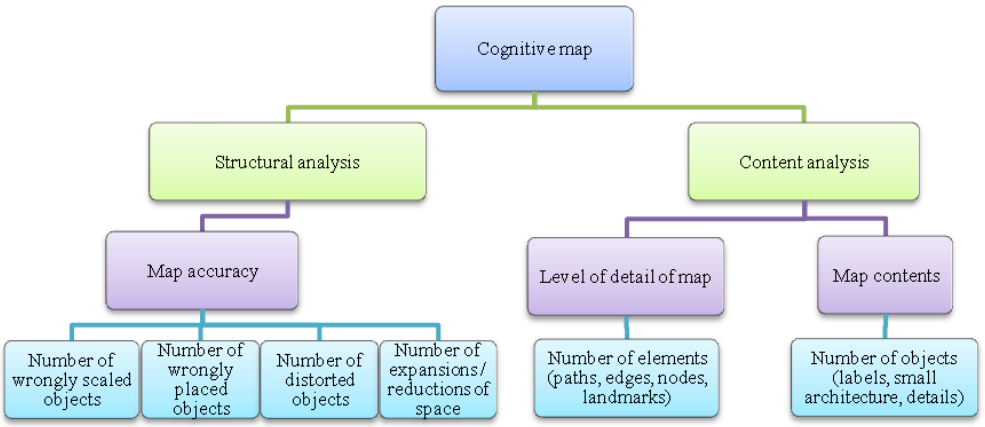
Because among the available research methods we have not found a tool that enabled easy and objective analysis of complex sketch maps of large areas, which would let us gather data about the content and structure characteristics of the drawings, and to make comparisons not only on the level of the entire map, but also in particular areas (districts), we have created the CogMap Analyst program.

Based on the knowledge and tools proposed by other researchers, we have developed a computer program that allows for a precise analysis of sketch drawings of cognitive maps of any area. Starting with Lynch's theory about types of elements and types of errors appearing on sketch drawings, we wanted to create a tool that would let us determine various characteristics of drawings of maps in an objective and measurable manner. Objective data gathered in this way could then be used for further analysis, including for studying relations between the characteristics of cognitive maps and the personal traits and/or formal traits of space.

The CogMap Analyst program is built on Tolman's neobehavioral conception, which assumes that organisms, in the course of exploring their environment, develop expectations as to the effects of their actions in the space through analysing the results of their earlier experiences (Tolman, Ritchie, and Kalish, 1946). Expectations that have formed in the process of learning a space create a cognitive map, understood as a set of patterns

of behaviour in a concrete situation and the basis for searching for alternative behavioural choices in the event of unexpected changes in the environment.

Sketch drawings can be analysed with respect to their (a) structure and (b) content in order to determine their substance (components) and distortions (understood as errors described above according to Lynch's (1960) types). Based on the subject literature, we have constructed a model of analysing the drawings of cognitive maps in the form of a sketch drawing. The criteria of analysing sketch maps are shown on the graph below.



Graph1. Chart of analysing sketch maps.

By structural differentiation we mean the differentiation of cognitive maps expressed on a sketch drawing in relation to their accuracy. By map accuracy we mean the number of correctly reproduced objects appearing in the real environment on the map. Empirical indicators of map accuracy include: (a) number of wrongly scaled elements on map (paths, nodes, landmarks, and districts), (b) number of distorted elements (paths, nodes, landmarks, and districts), (c) number of reductions and expansions with elements that do not exist in a given area (paths, nodes, landmarks, and districts), and (d) number of wrongly placed elements (paths, nodes, landmarks, districts). Elements are considered wrongly placed if their numerical parameters (size, spatial placement in relation to other objects) exceed the confidence interval of one standard deviation determined based on all research results. The variable of accuracy takes the numerical value of the sum of numbers in the above categories of errors on cognitive maps. This way it is possible to distinguish between accurate and inaccurate maps.

By content differentiation we mean the differentiation of maps in relation to their level of detail and to their content. By level of detail we mean the number of objects on the map which also appear in the real environment. The empirical indicator of a map's level

of detail will be the number of elements marked on the map (paths, nodes, landmarks, and districts). The variable of level of detail is the sum total number of these objects. This way it is possible to distinguish detailed and not detailed map categories. By content of maps we mean the abundance or scarcity of elements related to contents, which also appear in the real world. The empirical indicator of abundance/scarcity on maps is a variable consisting of the number of (a) architectural details, (b) labels, and (c) small architecture objects. Thus maps can be divided into abundant/scarce.

The above scheme does not take into account the analysis of elements which Lynch has dubbed "edges", because they are necessary to divide an urbanized area into districts. So the analysis of districts by itself includes the analysis of the placement and metric characteristics of edges.

2.2. Description of the operating principles of the CogMap analyst program

The CogMap Analyst program prepared by us allows analysing the structure and contents of sketch maps of any space (especially urbanized spaces) by:

(1). Determining the number of objects of different types (landmarks, paths, nodes, and districts) on a sketch map;
(2). Determining the dimensions and placement of the objects in space;
(3). Analysing the accuracy of the size and placement of a given object in relation to a cartographical map and to the scale and general distortion of the sketch map;
(4). Determining parameters of the analysed space such as (a) legibility – illegibility, (b) preferences (liked – disliked), and the parameter of the type of the sketch drawing (sequential – spatial – hybrid).

In order to determine the way a sketch map was drawn in a quantitative (metrological) manner, we have designed and developed the CogMap Analyst program, written in the LabVIEW environment. It allows us to precisely locate the studied areas and objects in a coordinate system superimposed on sketch maps, and to use analytical geometry to determine the parameters of each object. In order to obtain a unified format of results for different types of objects, e.g. for landmarks as well as paths, we have used the geometrical centres of figures (centroids (fig. 1)). Determining a numerically expressed position of objects on sketch maps is necessary to obtain the knowledge which lets us compare them, because a lack of measurable results would yield unproductive and disappointing information.

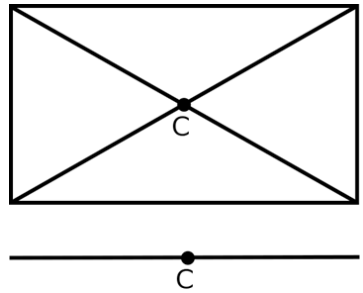


Figure1:Geometric centers of figures marked on a rectangle (district or landmark) and on a segment (path).

In order to analyse sketch maps drawn by study participants, we must firstly create a set of reference data, determined on the basis of the original plan of a given place. This method is necessary, because it enables an objective comparison of the sketch with reality. The data that are taken from the objects marked on the map, are coordinates of edges and rotation of the figure in relation to the geometric centre (regarding districts and landmarks), coordinates of the starting and ending points (regarding paths), and coordinates of a point (regarding nodes) (fig. 2).

Dividing the studied area into smaller fragments enables a comparison of objects not only in relation with their real size (appearing on the original cartographic plan), but also in relation to distortions of the areas in which they lie. We have included a possibility of making any desired division by areas and a possibility to analyse nodes as independent objects (i.e. without calculating distortion in relation to regions).

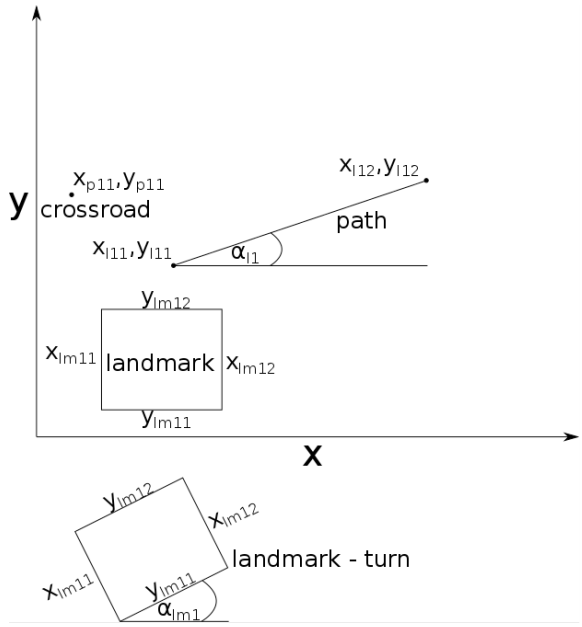


Figure 2: Marking data yielded from analysis of sketch maps.

Two basic forms of distortion taken into account in the analysis of objects on the map include scale and displacement. Depending on the type of the object they were applied in different configurations, which we have presented in table 1. We are using this divisionbecause it is an objective method of analysing distortions which is possible to use on a small number of participants, meaning a situation where it is impossible to use a neural network to compare sketches.

Type of object	Analysed distortions
District	Displacement, Scale.
Landmark	Displacement, Relative displacement, Absolute scale, Relative scale, Rotation.
Path	Displacement, Relative displacement, Absolute elongation, Relative elongation, Rotation.
Node	Displacement.

Table1: Analysing distortion depending on the object.

For each map it is possible to determine additional characteristics, beyond Lynch's typology, i.e. its type (per: Appleyard, 1970 and Hunay et al. 2008), total number of objects, number of details, number of labels, surplus objects (expansions), legibility and preference (affective component of attitude). The next required step in the analysis is marking districts in order to determine if and how they are distorted. Displacement and change of scale of districts are information necessary for analysing relative distortions of the rest of the objects, disregarding nodes which lie outside of districts (fig. 3).

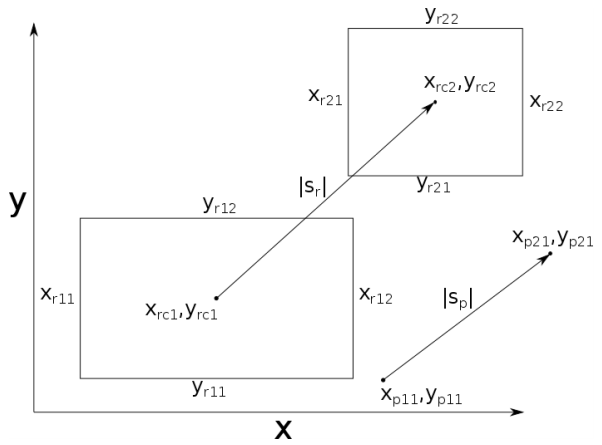


Figure3: Displacement and change of scale of district, and displacement of a node

Distortions of objects presented on figure 3 are calculated by using the following formulae for:

– displacement of district $|s_r|$:

$$x_{rc1} = \frac{x_{r11} + x_{r12}}{2}$$
$$y_{rc1} = \frac{y_{r11} + y_{r12}}{2}$$
$$x_{rc2} = \frac{x_{r21} + x_{r22}}{2}$$
$$y_{rc2} = \frac{y_{r21} + y_{r22}}{2}$$
$$|s_{rx}| = x_{rc2} - x_{rc1}$$
$$|s_{ry}| = y_{rc2} - y_{rc1}$$
$$|s_r| = \sqrt{(x_{rc1} - x_{rc2})^2 + (y_{rc1} - y_{rc2})^2}$$

– change of scale of district dP_r:

$$w_{r1} = x_{r12} - x_{r11}$$
$$h_{r1} = y_{r12} - y_{r11}$$
$$w_{r2} = x_{r22} - x_{r21}$$
$$h_{r2} = y_{r22} - y_{r21}$$
$$dw_r = \frac{w_{r2}}{w_{r1}}$$
$$dh_r = \frac{h_{r2}}{h_{r1}}$$
$$P_{r1} = (x_{r12} - x_{r11}) \cdot (y_{r12} - y_{r11})$$
$$P_{r2} = (x_{r22} - x_{r21}) \cdot (y_{r22} - y_{r21})$$
$$dP_r = \frac{P_{r2}}{P_{r1}}$$

displacement of node $|s_p|$:

$$|s_p| = \sqrt{(x_{p1} - x_{p2})^2 + (y_{p1} - y_{p2})^2}$$

Analysing distortions of landmarks and paths requires making calculations for the two cases mentioned before: relative and absolute. In the absolute case, displacement and change of scale or length of an object on a sketch is calculated without taking into account the position of the rest of the elements on the drawing. In the relative case, first and foremost, based on the placement and size of the district containing the considered object on the sketch, the coordinates are calculated where a given element should be, together with its size, if it was displaced and rescaled in exactly the same way as the district was. Next, based on these "predicted" values, relative values of distortion are calculated. Absolute displacement was shown on the coordinate system on figure 4 – it is the ideal case when there is no relative displacement or relative change of scale (objects are ideally reproduced in the displaced district), both of which were presented on the second system of coordinates.

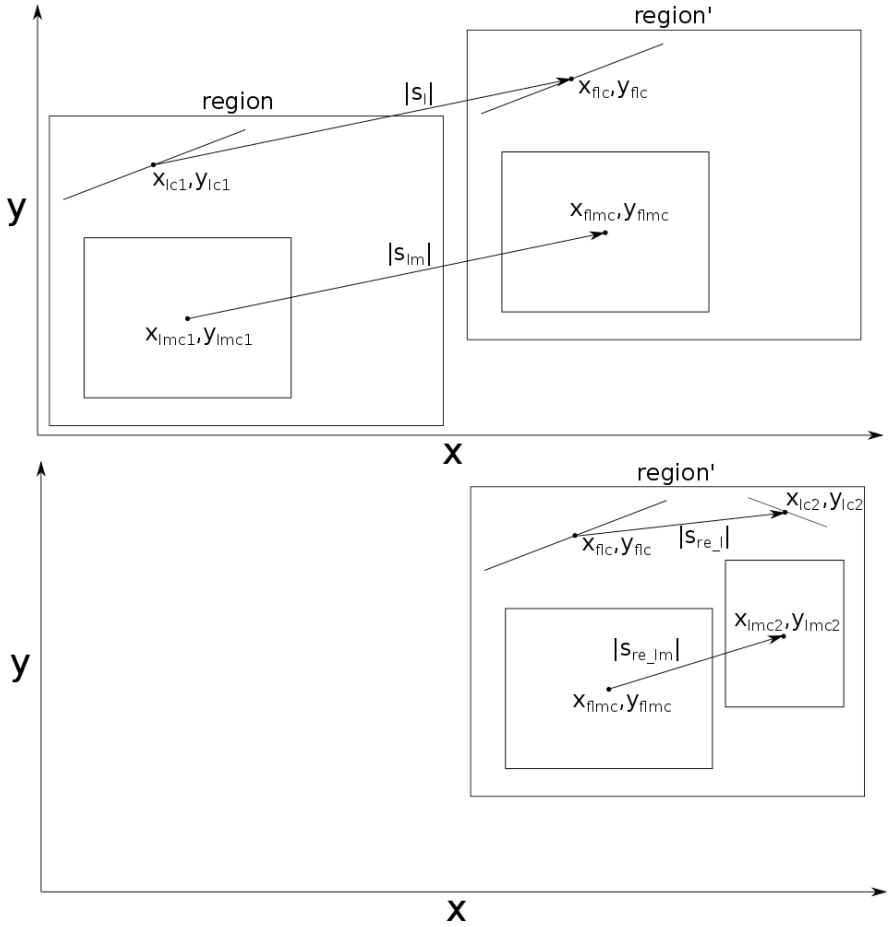


Figure 4: Displacement and change of length of a path and displacement and change of scale of a landmark. Absolute displacement is shown on the first coordinate system (while keeping the same length of the path and scale of landmark), presenting an arrangement of objects correctly placed in the displaced district (so that the "predicted" placement of objects is kept). The second system of coordinates contains a presentation of the method of determining the displacement of objects in relation to the change of placement of the district.

Distortions of objects presented on figure 4 were calculated by using the following formulae for:

– displacement of a path $|s_l|$:

$$x_{lc1} = \frac{x_{l11} + x_{l12}}{2}$$

$$y_{lc1} = \frac{y_{l11} + y_{l12}}{2}$$

$$x_{lc2} = \frac{x_{l21} + x_{l22}}{2}$$

$$y_{lc2} = \frac{y_{l21} + y_{l22}}{2}$$

$$|s_l| = \sqrt{(x_{lc1} - x_{lc2})^2 + (y_{lc1} - y_{lc2})^2}$$

– change of length of a path dl:

$$l_{l1} = \sqrt{(x_{l11} - x_{l12})^2 + (y_{l11} - y_{l12})^2}$$
$$l_{l2} = \sqrt{(x_{l21} - x_{l22})^2 + (y_{l21} - y_{l22})^2}$$
$$dl = \frac{l_{l2}}{l_{l1}}$$

– change of angle of alignment of a path $d\alpha_l$:

$$\alpha_{l1} = arctg\,\frac{|y_{l11} - y_{l12}|}{|x_{l11} - x_{l12}|}$$
$$\alpha_{l2} = arctg\,\frac{|y_{l21} - y_{l22}|}{|x_{l21} - x_{l22}|}$$
$$d\alpha_l = \alpha_{l1} - \alpha_{l2}$$

– predicted placement of a path x_{fcl}, y_{fcl}:

$$x_{flc} = x_{r21} + dw \cdot (x_{lc1} - x_{r11})$$
$$y_{flc} = y_{r21} + dh \cdot (y_{lc1} - y_{r11})$$

– relative displacement of a path $|s_{re\_l}|$:

$$|s_{re\_l}| = \sqrt{(x_{flc} - x_{lc2})^2 + (y_{flc} - y_{lc2})^2}$$

– predicted length of a path l_f:

$$l_f = \sqrt{[(x_{l11} - x_{l12}) \cdot dw]^2 + [(y_{l11} - y_{l12}) \cdot dh]^2}$$

– relative change of length of a path $|dl_{re}|$:

$$|dl_{re}| = \frac{l_{l1}}{l_f}$$

– displacement of a landmark $|s_{lm}|$:

$$x_{lmc1} = \frac{x_{lm11} + x_{lm12}}{2}$$
$$y_{lmc1} = \frac{y_{lm11} + y_{lm12}}{2}$$
$$x_{lmc2} = \frac{x_{lm21} + x_{lm22}}{2}$$
$$y_{lmc2} = \frac{y_{lm21} + y_{lm22}}{2}$$
$$|S_{lm}| = \sqrt{(x_{lmc1} - x_{lmc2})^2 + (y_{lmc1} - y_{lmc2})^2}$$

– change of scale of a landmarkdP_{lm}:

$$P_{lm1} = (x_{lm12} - x_{lm11}) \cdot (y_{lm12} - y_{lm11})$$
$$P_{lm2} = (x_{lm22} - x_{lm21}) \cdot (y_{lm22} - y_{lm21})$$
$$dP_{lm} = \frac{P_{lm2}}{P_{lm1}}$$

– rotation of a landmark $d\alpha_{lm}$:

$$d\alpha_{lm} = \alpha_{lm1} - \alpha_{lm2}$$

– predicted placement of a landmarkx_{flmc}, y_{flmc}:
$$x_{flmc} = x_{r21} + dw \cdot (x_{lmc1} - x_{r11})$$
$$y_{flmc} = y_{r21} + dh \cdot (y_{lmc1} - y_{r11})$$

– relative displacement of a landmark $|s_{re\_lm}|$:
$$|s_{re\_lm}| = \sqrt{(x_{flmc} - x_{lmc2})^2 + (y_{flmc} - y_{lmc2})^2}$$

– predicted size of a landmarkP_{flm}:
$$P_{flm} = P_{lm1} \cdot dP_r$$

– relative scale of landmarkdP_{re_lm}:
$$dP_{re\_lm} = \frac{P_{lm2}}{P_{flm}}$$

Using the above algorithms, we can obtain objective results, which can be subjected to further analysis (i.e. statistical analysis). The method allows for comparing the results of other research to sketches not only in a qualitative manner, but also in a quantitative manner, which is an approach which has not been heretofore employed on a large scale.

2.3. Description of the functions of the program

The program consists of functions responsible for two basic tasks: preparing the research area and data analysis (fig. 5). Preparing the research area consists of creating a list of districts (fig. 6), and then assigning elements to each of them (it is worth it to keep the name of each element unique, in order to avoid mistakes when they are marked later), and dividing the elements into types. Further, the base map must be analysed, meaning a map that will correspond to the area where the research will be conducted. The program automatically scales all images to 500 pixels in width, and 700 pixels in height, which corresponds to the proportions of an A4 sheet of paper with a 1% confidence interval, but it is still recommended to make scans of drawings obtained from participants in one resolution and on automatic devices, because we have noticed during tests that scans tend to be displaced in relation to one another when different devices or scanning by hand is used. A constant width and height of image also allows the program window to fit in whole on most standard monitors.

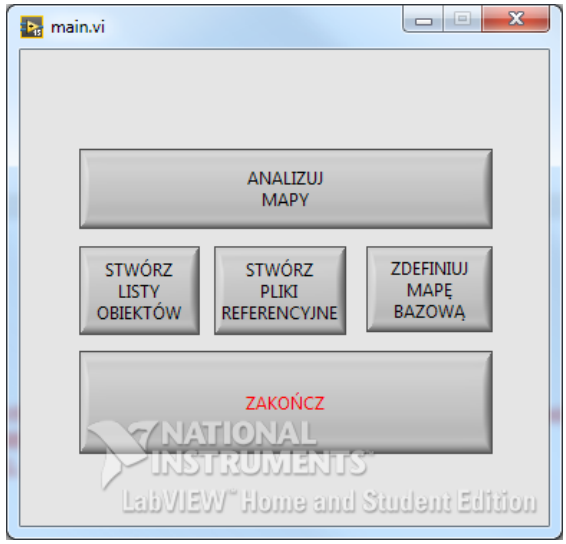


Figure 5: Main window of the CogMap Analyst program

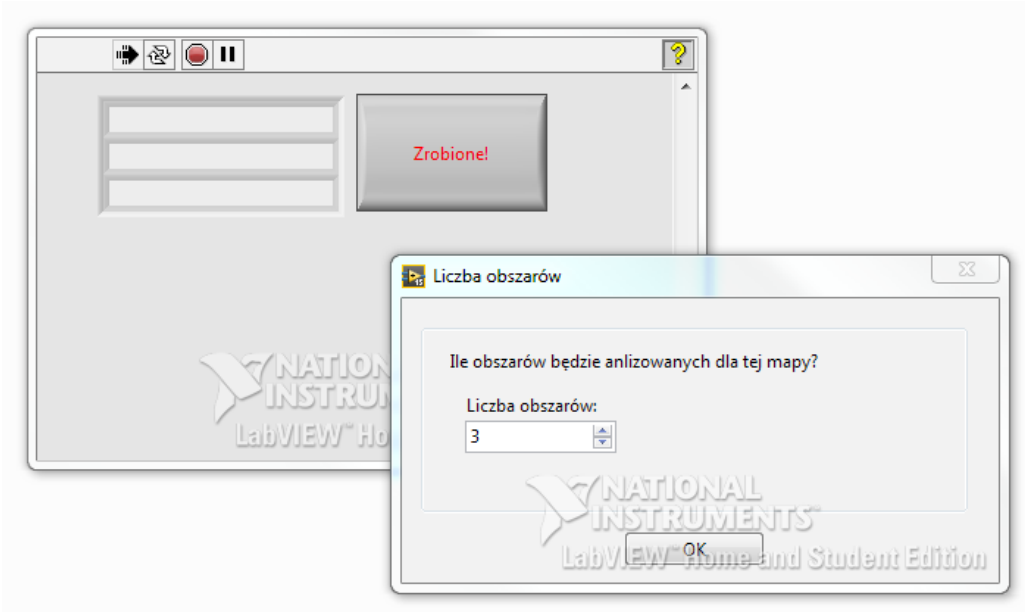


Figure 6: Interface for making lists of districts and objects.

In order to analyse data, it is also necessary to create the mentioned files with reference data, with which further results will be compared. This part of the configuration of the program is similar to conducting the proper analysis of maps, but it only requires marking all districts and objects on the base map (fig. 7), meaning those that will be used in the study and will be mentioned on the discussed lists.

The above steps are done once, and their effects are saved in .txt files for lists of objects, which allows for easy modification, and in .xml for reference files, so that it is pos-

sible to read them outside of the program as well. Until the configuration procedure is repeated, analysis will be carried out each time according to the prepared scheme.

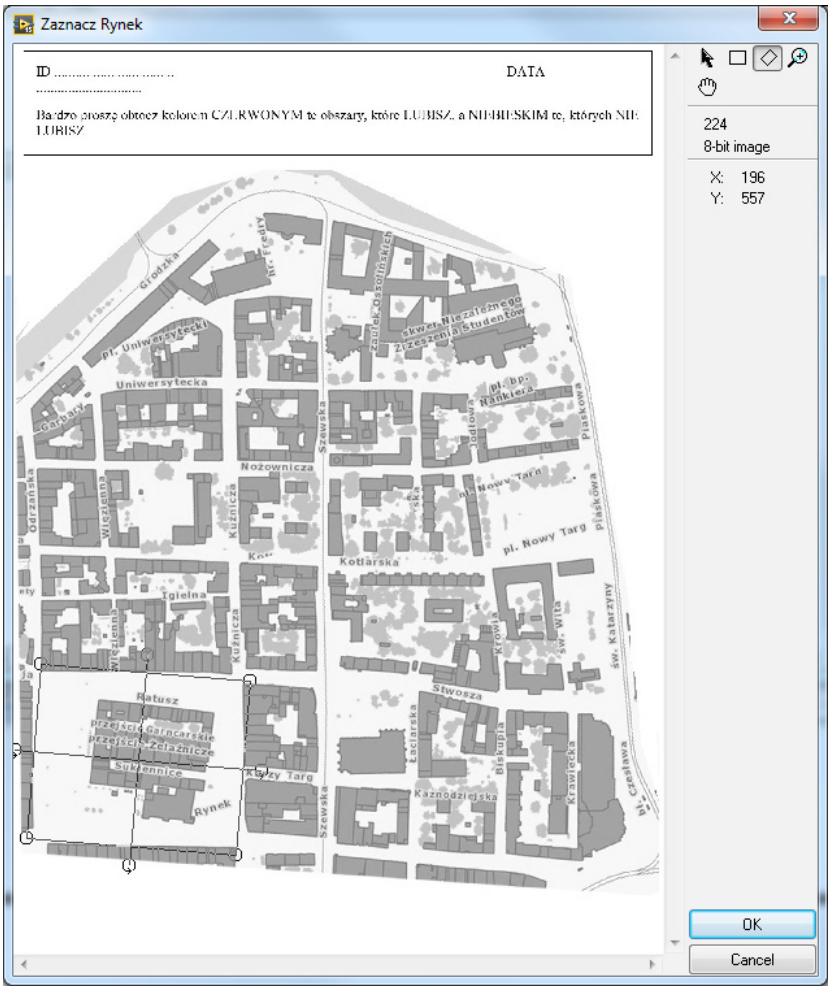


Figure 7: Fragment of the interface responsible for marking particular elements on maps, created using the NI-IMAQ library, which is used for handling cameras.

To use the program correctly, it is also necessary for the participants to receive an underlying map, which contains a fragment of the cartographical map of the places adjacent to the researched area (whose map is to be drawn), so that they are able to use the proper scale. Without this assumption it is impossible to obtain correct data about the appearing distortions of size of objects and areas.

Data analysis is similar to preparing reference files (in the context of acquiring data about the shape and placement of objects), but this stage is preceded by determining other parameters characterizing the studied area according to the participant (fig. 8). Type of map must be determined, then elements, labels, and details appearing in the districts

must be counted, and the number of surplus objects, which obviously do not appear on the map (e.g. the Sphinx drawn in the centre of Cairo), must also be counted. Additionally, the participant's attitude towards the studied area and whether it is considered legible (as understood by Lynch (1960)) is measured. Gathering this data is optional, and dependent on the researcher's approach. If gathering information on any of the above characteristics is redundant in a given study, the rubric should be omitted.

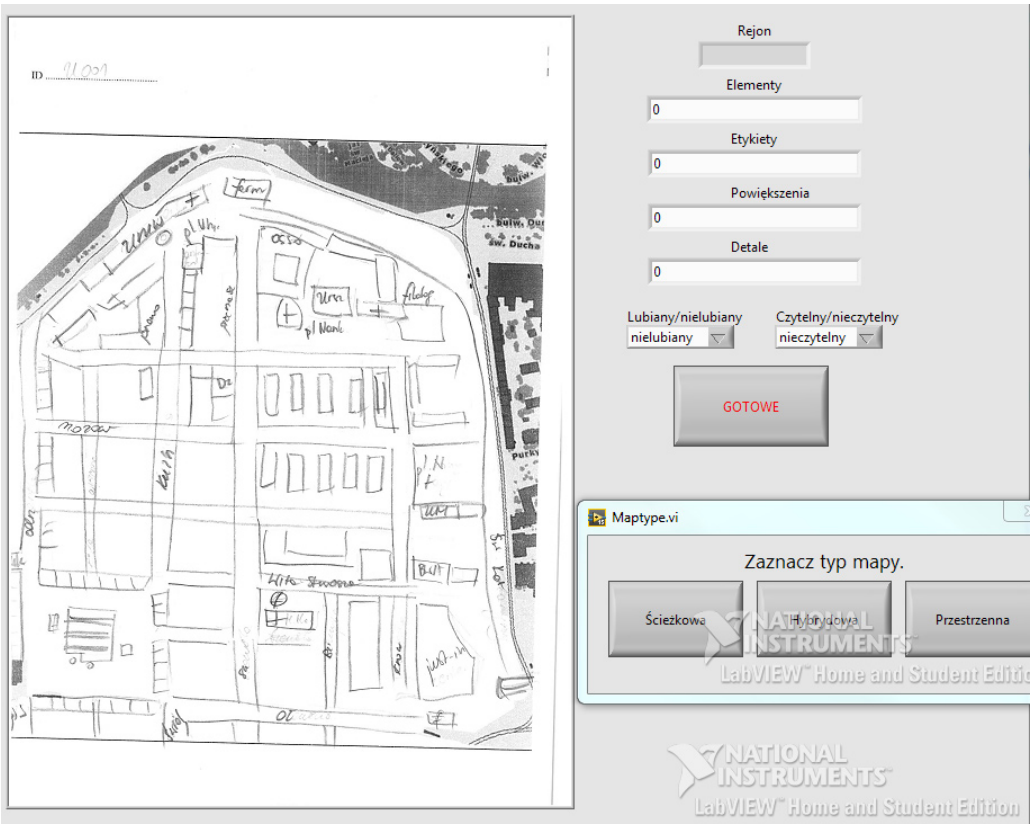


Figure 8: Interface used for entering data about the sketch.

Calculations are done when necessary for each marked object, but results are only saved after the entire analysis of the sketch is finished. In order to simplify further treatment of data, they are saved in the form of a simple text file with a delimiter in the form of spaces, and results from subsequent sketches written in a new line. The heading for results is saved a separate file, and is constructed so as to facilitate reading the data by hand, should the need arise.

3. Discussion

The CogMap Analyst program put forward by us enables gathering numeric data regarding the structure and content characteristics of cognitive maps of urbanized spaces in the form of sketch maps. Scientific research into this subject has been continued by psychologists for a few decades, and many aspects of construction and differentiation of maps still remain unexplained (Tu Huynh and Doherty, 2007). In order to make it possible to analyse differences in cognitive maps of spaces when using the method of sketch drawing, it is necessary to develop a reliable tool for measuring differences in the yielded research material (sketches). As we have presented in the theoretical part of this article, psychologists have developed many methodologies of analysing drawings. However, in order to enable comparison of results, it is important to create a coherent method of scientific investigation. Thus, with psychologists who study the reasons for differentiation of cognitive maps of urbanized spaces in minds, we have created the CogMap Analyst program, which is an easy to use and precise tool, which enables quantitative measurement of numerous parameters of elements appearing on sketches. The data obtained in this way are parameters of dependent variables, which can then be compared with values of the analysed independent variables (e.g. demographic variables such as age, sex, place of origin, or attitudes, cognitive process characteristics, and formal traits of the studied environment).

Thanks to this tool, maps may be analysed very precisely and objectively, and concrete information about the changes in size and placement of particular objects in relation to actual shapes or in relation to the given drawing can be obtained. The method allows for rejecting the objection stated by many researchers regarding the subjectivity of evaluation of obtained results and low reliability of the sketch method (Schmeicka and Thurston, 2007). Moreover, results obtained with CogMap Analyst give a wide view of the way in which urbanized space in a given area is perceived by a particular person. Importantly, we gain independent data about types of objects which appear on maps, which is an important information for qualitative analysis of a given drawing. What type of objects and in what quantity does a given person present on their mental map may be an important indicator of their preference or other personal traits (Lynch, 1960).

The theoretical assumptions made, including the joint but also independent analysis of the structure as well as contents of a sketch drawing give a comprehensive view of the characteristics of cognitive maps. The program allows for gathering data in a relatively quick manner, and for obtaining objective, metric data. Moreover, the analysis of results is carried out automatically.

Because the LabVIEW environment was used to create the program, and because the application itself is written in a modular way, it is relatively easy to continue to develop and modify CogMap Analyst depending on the needs and requirements of a par-

ticular study. At this stage, the program only yields raw data, which must then be imported to appropriate statistical software in order to carry out further analysis.

It should be considered if, when the next version of the program is created, it would be a beneficial solution to add the possibility to analyse the placement of objects in relation to other objects nearby. This solution was used by, among others, Rovine and Weisman (1989). It would enable a deeper look in to the structure of the image of a cognitive map in the memory of the participant, and give the researchers information allowing for a wider understanding of the structure of spatial cognitive maps stored in human memory.

Rovine and Weisman (1989) put forward a method of analysing sketch maps which consisted of gathering four measures: (1) counting the frequency of marking landmarks, segments of streets, and nodes; (2) determining the type of map as spatial or sequential according to Appleyard's (1970) developed division (spatial maps show the existence of interrelations between paths on the map; sequential maps are representations of sequences of objects encountered one after another, as if on route from point A to point B); (3) accuracy of a cognitive map was determined based on a correct topological reproduction on a drawing of each of 20 landmarks marked by the researchers in a given area. A building was considered correctly reproduced if it (a) was drawn in the appropriate place between the two closest buildings in the area, and (b) was placed by the appropriate path. Accuracy of placement of a building on a cognitive map was therefore determined based on its correct placement in relation to other objects on the map.

Rovine's and Weisman's assumptions seem correct, however such a methodology creates difficulties when drawings of cognitive maps lack so many analysed objects (landmarks and paths) that it is impossible to control the fulfilment of criteria of accuracy of the cognitive map. A universal tool for quantitative analysis of cognitive maps of spaces should be based on data coming from drawings by participants, and not an outside criterion of relations between objects appearing in real space (because these other reference points may not be marked on a map, which may produce an erroneous categorization of an object as wrongly placed). This question must be considered in depth and it must be found out if it is possible to include the analysis of placement of objects in relation to one another.

According to our knowledge, CogMap Analyst is, at this time, the most comprehensive available tool for analysing the characteristics of sketch maps. It is easy to use and flexible, it is possible to use it to analyse areas of any size, with varied spatial layouts or containing varied architectural objects. The quantity and variability of obtained data allows for conducting very different and complex statistical analyses in relation to the adopted research goals. We hope that it will be used by many researchers to gain empirical knowledge related to the characteristics of sketch maps of different environments in different groups and types of people.

References:

Appleyard, D. (1970). *Notes on Urban Perception and Knowledge.* Pittsburg: EDRA.

Arnold, A. E. G. F., Burles, F., Krivoruchko, T., Liu, I., Rey, C. D., Levy, R. M., Iaria, G. (2013). Cognitivemapping in humans and itsrelationship to otherorientationskills. *Experimental Brain Research*, 224(3), 359–372.

Banai, R. (1999). A methodology for the image of the city. *Environment and Behavior B: Planning and Design* 26, 133–144

Banerjee, T., Battro, A., Ellis, E., Downton, P., Susulowska, M. & Tomaszewski, T. (1977). *Growing up in cities.* Cambridge: MIT Press.

Bell A. P., Greene Th. C., Fisher J. D. & Baum A. (2004). *Psychologia Środowiskowa*. [Environmental psychology]. Gdańsk: Gdańskie Wydawnictwo Psychologiczne.

Bors, D., Vigneau, F. (2011). Sex differences on the mental rotation test: Ananalysis of item types. *Learning and Individual Differences*. 21(1), 129–132.

Buttenfield, B. P. (1986). Comparing distortion on sketch maps and misconfigurations. *Professional Geographer*. 38(3), 238–246.

Cadwallader, M. (1976). *Cognitive distance in inter-urban space*. In: Moore, G. T. & Golledge, R. G. (Eds.). EnvironmentalKnowing. Stroudsberg, PA: Dowden, Hutchinson & Ross, 316–324.

Cadwallader, M. (1979). Problems in cognitivedistance: Implications for cognitivemapping. Environment and Behavior, 11, 559–576.

Carbon, C. C., Hesslinger, V. M. (2013). Attitudes and cognitive distances: On the nonunitary and flexible nature of cognitive maps. *Advances in Cognitive Psychology*. 9(3), 121–129.

Chaney, D. (2010). Analyzing Mental Representations: The Contribution of Cognitive Maps. *Recherche et Applications En Marketing*. 25(2), 93–115.

Day, R. (1976). Urban distance cognition: Review and contribution. *Australian Geographer*. 13, 193–200.

Downs, R. M. & Stea, D. (1973). *Image and environment: cognitive mapping and spatialbehavior*. New Brunszwik: AldineTransaction.

Eppler, M. J., Pfister, R. (2011). *Sketching as a Tool for Knowledge Management: An Interdisciplinary Literature Review on its Benefits*. 11th International Conference on Knoweldge Management and Knowledge Technologies, I-KNOW 2011, 1–6.

Foo, P., Warren, W. H., Duchon, A.& Tarr, M. J. (2005). Do humans integrate routes into a cognitive map? Map- versus landmark-based navigation of novel shortcuts. *Journal of Experimental Psychology. Learning, Memory, and Cognition.* 31(2), 195–215.

Forbus, K. D., Usher, J., Chapman, V. (2003). *Qualitative spatial reasoning about sketch maps.* 15th Annual Conference on Innovative Applications of Artificial Intelligence. Acapulco, Mexico.

Forbus, K. D., Usher, J., Lovett, A., Lockwood, K.& Wetzel, J. (2008). *CogSketch: Open-domain sketch understanding for cognitive science research and for education*. EUROGRAPHICS Workshop on Sketch-Based Interfaces and Modelling. Annecy, France.

Frey, D. (1986*). Recent research on selective exposure to information.* In: L. Berkowitz (Eds.). Advances in experimental social psychology. Nowy Jork: Academic Press, 41–80.

Hauziński, A. (1997). Znaczenie pojęcia mapy i metody jego operacjonalizacji w psychologii. [Meaning of the contept of the cognitive map and methods of its operationalization in psychology]. *Czasopismo psychologiczne.* 4, 259–274.

Hutorwicz, H. D., Adler, F. (1911). Maps of Primitive Peoples*. Bulletin of the American Geographical Society*. 43(9), 669–679.

Huynh N. T. U., Hall G. B., Doherty S. & Smith W. W. (2008). Interpreting urban space through cognitive map sketching and sequence analysis. *The Canadian Geographer/ Le Géographe canadien.* 52, 2, 222–240.

Imania, F., Tabaeian, M (2012). Recreating mental image with the aid of cognitive maps and its role in environmental perceptron. *Procedia – Social and Behavioral Sciences*. 32, 53–62.

Ishikawa, T., Daniel R. Montello, D. R. (2006). Spatial knowledge acquisition from direct experience in the environment: Individual differences in the development of metric knowledge and the integration of separately learned places. *Cognitive Psychology*, 52, 93–129.

Kara, B. (2013). Landscape Design and Cognitive Psychology. *Procedia – Social and Behavioral Sciences.* 82, 288–291.

Kelvin, W. T. (1883). Electrical Units of Measurement. *Popular Lectures*. 1, 73.

Kitchin, R. M. (1996). Methodological convergence in cognitive mapping research: investigating configurational knowledge. *Journal of Environmental Psychology.* 16, 3, 163–185.

Lewicka, M. & Bańka, A. (2008). Psychologia środowiskowa [Environmental psychology]. In: J. Strelau & D. Doliński (Eds.), Psychologia. Podręcznik Akademicki Tom 2 [Psychology. Academic textbook. Volume 2]. (s.497–544). Gdańsk: Gdańskie Wydawnictwo Psychologiczne

Lloyd, R., Heivly, C. (1987). Systematic distortions in urbancognitive maps. *Annals of the Association of American Geographers.* 77, 191–207.

Lynch, K. (1960). *The Image of the City*. Massachusetts Institute of Technology and the President and Fellows of Harvard College.

Montello, D. R. (1992). The geometry of environmental knowledge. *Theories and Methods of Spatio-Temporal Reasoning in Geographic Space.* 136–152.

Nedas, K. (2006). *Semantic similarity of spatial scenes*. PhD Thesis, University of Maine, Orono, ME, USA, p. 309.

Nedas, K., Egenhofer, M. (2008). Spatial-scene similarity queries. *Transactions in GIS.* 12(6), 661–681.

Pinheiro, J. Q. (1998). Determinants of Cognitive Maps of the World as Expressed in Sketch Maps. *Journal of Environmental Psychology.* 18(3), 321–339.

Rovine, M. J., Weisman, G. D. (1989). Sketch-map variables as predictors of way-finding performance. *Journal of Environmental Psychology.* 9, 217–232

Schmeinck, D., Thurston, A. (2007). The influence of travel experiences and exposure to cartographic media on the ability of ten-year-old children to draw cognitive maps of the world. *Scottish Geographic Journal.* 123(1), 1–15.

Stokols, D. (1978). Environmental psychology. *Annual Review of Psychology.* 29, 253 295.

Stryjewska, D., Janda-Dębek, B. (2013). Mental Representations And Cognitive Maps In Humans A Review Of Research And Theory. *Polish Journal of Applied Psychology.* 11, 83–106.

Tolman, E. C. (1948). Cognitive maps in rats and men. *Psychological Review.* 55, 189–208.

Tolman, E.C., Ritchie, B. F., Kalish, D. (1946). Studies in Spatial Learning. I. Orientation and the Short-Cut. *Journal of Experimental Psychology*. 6, 1–13.

Tu Huynh, N., Doherty, S. T. (2007). Digital Sketch-Map Drawing as an Instrument to Collect Data about Spatial Cognition. Cartographica 42, (4), 285–296.

Tversky, B. (1993*). Cognitive maps, cognitive collages and spatial mental models*. In: A. Frank, I & Campari (eds.). Spatial Information Theory. A Theoretical Basis for GIS : European Conference, COSIT'93. Springer-Verlag, Berlin, s. 14–24

Tversky, B. (2002). What do Sketches say about Thinking. Proceedings of AAAI Spring Symposium on Sketch Understanding, 205–210.

Tversky, B. (2003). *Navigating by Mind and by Body.* In: C. Freksa, W. Brauer, C. Habel & K. Wender (Eds.). Spatial Cognition III. Routes and Navigation, Human Memory and Learning, Spatial Representation and Spatial Learning, Springer-Verlag GmbH & Co. KG, Berlin, 1–9.

Tversky, B. (2008) *Spatial Cognition. Embodied and Situated*. In: P. Robbins & M. Aydede (Eds.) The Cambridge handbook of situated cognition. Cambridge University Press, Cambridge, 201–216.

Wojciszke, B. (1980). Zależność spostrzegania interpersonalnego od postawy wobec religii osoby spostrzegającej i spostrzeganej. [Dependency of interpersonal perception to the religious attitudes of the perceiver and observator]. *Zeszyty Naukowe Uniwersytetu Gdańskiego, Psychologia*, 3, 29 46.

Wojciszke, B. (2002). *Człowiek wśród ludzi*. [Man among men]. Warszawa: Wydawnictwo Naukowe Scholar.

Wong, K. Y. (1979). Maps in minds: An empirical study. *Environment and Planning A.* 11, 1289–1304.

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Affective response to a lottery prize moderates processing of payoffs and probabilities: An eye-tracking study[4]

Abstract

Expected utility theory posits that our preferences for gambles result from the weighting of utilities of monetary payoffs by their probabilities. However, recent studies have shown that combining payoffs and probabilities is often distorted by affective responses. In the current study, we hypothesized that affective response to a lottery prize moderates processing of payoffs and probabilities. Attentional engagement (measured by the number of fixations in the eye tracking experiment) was predicted by probability, value of an outcome, and their interaction, but only for affect-poor lottery tickets. A corresponding pattern of results was not observed in affect-rich lottery tickets, suggesting more simplified processing of such lotteries.

Keywords

affect, attention, decision-making, eye-tracking, probability

Streszczenie

Deskryptywne modele podejmowania decyzji (oparte na idei maksymalizacji oczekiwanej użyteczności) przewidują, że indywidualne preferencje wobec ryzyka wynikają z użyteczności potencjalnych wy-

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płat pieniężnych oraz prawdopodobieństwa ich otrzymania. Na przykład, zgodnie z przewidywaniami skumulowanej teorii perspektywy decydent wybiera zakład o wyższej wartości iloczynu użyteczności konsekwencji (subiektywnej reprezentacji wypłat pieniężnych) i wag decyzyjnych (subiektywnej reprezentacji prawdopodobieństwa). Ostatnie badania wykazały jednak, że poznawcza ocena oraz integracja wypłat i prawdopodobieństwa jest często zniekształcana przez reakcje afektywne. W obecnym eksperymencie prosiliśmy osoby badane o zapoznanie się z loteriami, w których można było wygrać nagrody budzące różne reakcje afektywne. Jednocześnie dokonywany był pomiar ruchu gałek ocznych. Postawiliśmy hipotezę, wedle której afektywna reakcja wobec nagrody będzie moderowała przetwarzanie wypłat oraz ich prawdopodobieństw. Otrzymane rezultaty wskazują, że poziom zaangażowania uwagowego (mierzonego liczbą fiksacji wzroku) był przewidywany przez prawdopodobieństwo wygrania danej nagrody, jej wartość oraz interakcję tych czynników. Związki te zachodziły jednak tylko dla loterii, które nie wywoływały reakcji afektywnych. Podobnego wzorca wyników nie zaobserwowano w przypadku loterii silnie afektywnych, co sugeruje bardziej uproszczony proces przetwarzania takich problemów decyzyjnych. Wyniki naszego badania są kolejnym dowodem na to, że procesy decyzyjne i ocena ryzyka w dużym stopniu zależą od intensywności reakcji afektywnych.

Słowa kluczowe

emocje, uwaga, podejmowanie decyzji, eye-tracking, prawdopodobieństwo

Introduction

Expected utility theory (von Neumann & Morgenstern, 1944) as well as its prominent descriptive alternatives (e.g., cumulative prospect theory, Tversky & Kahneman, 1992) posit that a decision-maker combines probabilities and consequences into a single "measure of value" (Starmer, 2000). That is, a rational choice is a result of the trade-off between alternatives made by weighting the utilities of consequences by their probabilities and by summing weighted outcomes across each alternative. For instance, an individual should prefer a gamble over a sure option when the expected utility of the former is higher. However, recent studies have demonstrated that accurate decisions can also be made using simple and fast heuristic processes that do not involve weighing and summing of utilities (e.g., priority heuristic, Brandstätter, Gigerenzer, & Hertwig, 2006). Moreover, it has been shown that efficient combining of the numerical characteristics of a lottery (i.e., probabilities and payoffs), as postulated by the expected utility theory, is often distorted by affective reactions to an outcome (Rottenstreich & Hsee, 2001). In this study, we address the question regarding differences in processing of probabilities and payoffs in cases of affect-rich and affect-poor outcomes. Specifically, we have employed eye-tracking methodology to investigate how information about payoff and probability is acquired in simple monetary lotteries and whether this process is moderated by the affective responses elicited by a lottery prize.

Despite a long tradition in decision sciences according to which the decision-making process is purely cognitive, a growing body of evidence has been accumulated in the

last few decades to show the crucial role of feelings and emotions in judgment and decision-making. Slovic, Finucane, Peters, and MacGregor (2007) argue that positive or negative affective responses to a stimulus serve as crucial information influencing the decision-making process. In this paper, we refer to *affect* defined by Slovic et al (2007) as "the specific quality of 'goodness' or 'badness' (i) experienced as a feeling state (with or without consciousness) and (ii) demarcating a positive or negative quality of a stimulus" (p. 1333). In this definition, affect is a part of the stimulus and its mental representation. That is, mental images of some objects or stimuli (e.g., a lottery prize) are tagged with affect, to which one could refer when making a judgment or decision. For example, in case of lottery prizes eliciting intense affective responses (i.e., affect-rich lotteries), a decision maker can rely on affect that serves as a cue simplifying a judgment and decision-making process. On the other hand, when no affective cue is provided (i.e., in affect-poor lotteries), a decision maker is more likely to use different information (e.g., calculating expected value using payoff and probability information).

One of the most important theoretical models linking emotions and decision-making – the risk-as-feelings hypothesis (Loewenstein, Weber, Hsee, & Welch, 2001) – assumes that cognitive integration of numerical characteristics of the decision problem (payoffs and probabilities) through expected utility calculus can be moderated by affective responses to a stimulus. Rottenstreich and Hsee (2001) documented a larger insensitivity to changes in the probability scale for affect-rich outcomes (a $500 coupon that could be redeemed toward expenses associated with holidays in Europe) than for affect-poor outcomes (a $500 coupon that could be used toward tuition payments at the university). A similar effect (i.e., a larger insensitivity to changes in numerical features of risky prospects) emerges when the magnitude of a stimulus (e.g., monetary value) is evaluated by feelings rather than by calculation (Hsee & Rottenstreich, 2004). In the same vein, it has recently been shown that people pay less attention to probability information in affect-rich than affect-poor decision problems what results in suboptimal choices (Pachur & Galesic, 2013). Importantly, in cases of affect-poor decision problems, people base their choices on compensatory strategies – they use weighting and summing processes to make the trade-off between payoffs and probabilities within each alternative (Pachur, Hertwig, & Wolkewitz, 2014). On the other hand, affect-rich decision problems lead to the incorporation of less effortful non-compensatory heuristic strategies: People pay less attention to probabilities and make more dimension-wise comparisons between alternatives. Following this line of results, affect-poor lotteries should lead to processing of payoffs and probabilities in a more expected utility-based calculation (interaction of payoffs and probabilities) whereas affect-rich lotteries should be related to processing based on simple heuristics (e.g., separate processing of payoffs and probabilities).

Recent research has shown that eye-tracking measures, such as the number and time of fixations, are related to the level of information processing (Horstmann, Ahlgrimm, & Glöckner, 2009) and the amount of attentional resources engaged in this processing (Fiedler & Glöckner, 2012). Furthermore, numerical characteristics of a lottery (i.e., probability, value of an outcome, and interaction between them) were predictive of the number of fixations on the favored gamble (Fiedler & Glöckner, 2012). Nevertheless, conclusions drawn from these studies are based only on emotionally neutral lotteries.

In this paper, we were interested in investigating the eye-movement pattern of payoff and probability acquisition at the initial stage of a decision-making process. That is, we expected differences in spontaneous payoff and probability information acquisition during the passive inspection of affect-rich and affect-poor lottery tickets. Our main hypothesis is that the process of integrating information about probabilities and values would be moderated by the strength of subjective ratings of affective responses to a lottery prize: Participants would pay more attention to integrate values and probabilities, but only in the case of affect-poor lotteries, whereas affect-rich lotteries would alter the integration process.

Materials and Methods

Participants

Twenty-seven undergraduate psychology students (71% females, age range from 19 to 28 years) took part in this study in exchange for course credits. All participants had normal or corrected-to-normal vision and gave informed consent before the experiment. Data from two participants were not submitted to further analysis because of an excessive gaze deviation in the eye-tracking calibration procedure (> 1.0º).

Materials and apparatus

Lottery tickets. Based on a pilot study in which 30 judges rated the intensity of affective responses evoked by 28 lottery prizes, eight lottery tickets were selected (Table 1). Each ticket was crossed with six probability levels (1%, 2%, 5%, 95%, 98%, 99%) and assigned to one of four monetary values (30 PLN, 60 PLN, 150 PLN, 250 PLN). We used these probability levels due to the shape of the probability weighting function (Tversky & Kahneman, 1992) which assumes the highest deviations from linear probability weighting at the endpoints of the probability scale. To avoid the possibility that some lottery tickets would be subjectively priced as more expensive due to their affective meaning or attractiveness, the assignment of monetary values was counterbalanced between affect-rich and affect-poor lottery prizes. In total, 48 different tickets: 6 (probabilities) x 4 (monetary values) x 2 (affect-rich/poor prizes) were used in this study.

Table 1. Lottery tickets with mean ratings of the intensity of affective reactions.

	Mean subjective ratings of affective response intensity (SD)	Monetary value in the eye-tracking study
1. Ticket to a concert by your favorite band	6.7 (3.0)	30 PLN
2. Newest album of your favorite band/artist	5.7 (2.5)	60 PLN
3. Romantic dinner with your partner in a restaurant	7.0 (2.4)	150 PLN
4. Shopping in your favorite store/boutique	8.0 (1.8)	250 PLN
5. Warm socks	3.1 (2.6)	30 PLN
6. Two coffee mugs with logo	1.7 (1.4)	60 PLN
7. Entrance to a construction industry exhibition	1.6 (1.4)	150 PLN
8. Participation in a labor law course	2.7 (1.9)	250 PLN

Eye movements recording. We presented stimuli using Experiment Center software (Version 3.4; SensoMotoric Instruments, Teltow, Germany) on a 475 × 300 mm monitor (resolution = 1024 × 768 pixels). Eye movements were registered using an iView RED250 eye tracker (SensoMotoric Instruments) that recorded binocularly at 120 Hz. Data were recorded using iView X 2.7 software, following five-point calibration plus validation (average measurement accuracy = 0.62°; *SD*= 0.49°).

Procedure

Participants were seated individually in a laboratory room approximately 60 cm from the monitor screen. We informed participants that they will be presented with several lottery tickets which they could win or buy for themselves in a hypothetical lottery (e.g., a ticket for a concert, two coffee mugs or a voucher for a romantic dinner). In each trial, participants were instructed to pay attention to a short description of the lottery ticket displayed on the top of the screen for 4000 ms. Next, a black fixation cross appeared in the center of the screen for 500 ms and was immediately followed by information about the probability of winning and the value of the lottery outcome presented in two separate white rectangles (subtending 5.7º and 3.8º of visual angle) located at a distance of 8.6º on the left- and right-hand side of the fixation point. In order to balance the effect of a side, each ticket was presented twice: (1) with the probability level on the left side and value on the right side, (2) inversely, with value on the left side and the probability level on the right side. After 4000 ms, a blank screen appeared, and an inter-trial interval of 1000 ms preceded the next trial that started automatically (for details see Figure 1). The study consisted of 96 trials (48 different lottery tickets varying in probability and value x 2 sides of the probability-value presentation). Three technical breaks for the recalibration of the eye tracker were included. After completing the eye-tracking measurement, participants

were asked to rate the intensity of affective reactions evoked by lottery tickets and prizes presented in the study using a 10-point scale (from 1 – *no affective reactions* to 10 – *very strong emotions*). The whole procedure lasted approximately 20 minutes.

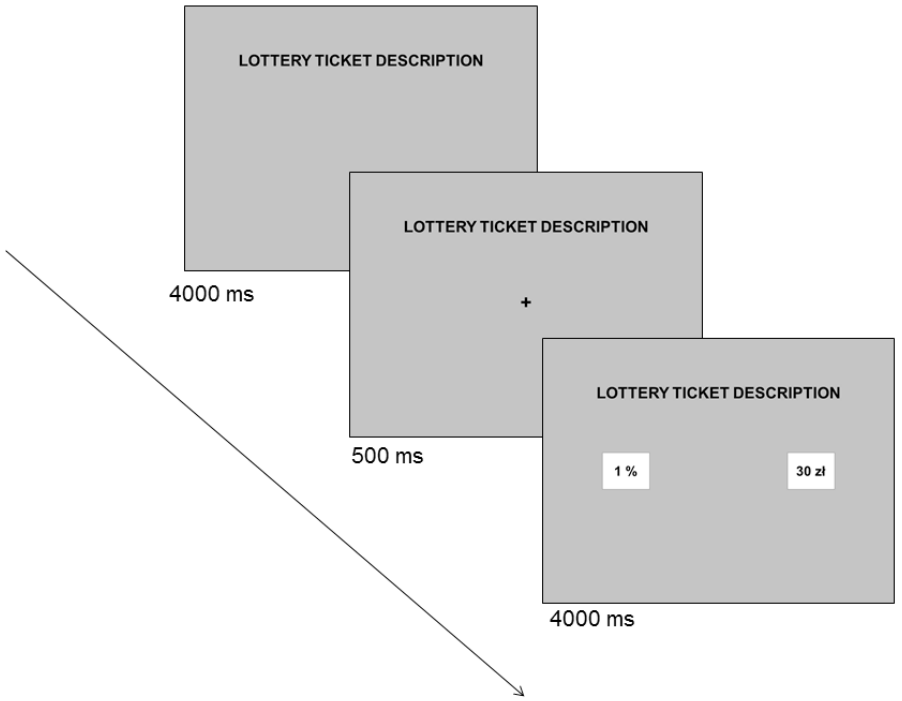

Figure 1. Schematic illustration of the sequence of events in each trial.

Results

Eye Movements Data Preprocessing

Eye-tracking data were analyzed using Begaze 3.4 software (SensoMotoric Instruments). Two identically sized (6.6º x 4.7º of visual angle) oval non-overlapping areas of interest (AOIs) covered the values and probabilities assigned to each lottery ticket. Analyses were conducted using two measures indicative of the amount of attentional resources engaged in information processing (the number of fixations and total dwell time, Holmqvist et al., 2011). Fixations were identified as eye-gaze events of a minimum duration of 80 ms and a maximum dispersion of 100 pixels. The dwell-time variable was defined as total time spent in the AOIs. Square root transformation was performed to normalize skewed distribution of a total dwell time in the AOIs. The overall number of 4,800 trials (96 lotteries x 25 subjects x 2 AOIs) was analyzed in this study.

Linear Mixed-effects Models Predicting Processing of Lottery Tickets

The statistical analyses and results reported below are based on linear mixed-effects models performed using the lme4 package (Bates, Maechler, Bolker, & Walker, 2014) version 1.1-7 run on R statistical computing software (2014) version 3.1.2. Fixed effect significance was tested with the lmerTest package version 2.0-20 (Kuznetsova, Brockhoff, & Christensen, 2014).

To investigate the fixed effects of the subjective intensity of affective responses to a lottery prize (i.e., affect), the numerical characteristics of lottery tickets (i.e., probability and value) and their interactions on information processing, two separate linear mixed-effects models were used with the number of fixations and dwell time in the AOIs as dependent variables and subjects, and AOI (value and probability) and AOI presentation side (left and right) as random effects (Table 2).

In both models, the number of fixations and dwell time in the AOIs increased with higher value and probability. Interestingly, we found a significant interaction of affect, probability and value in predicting the amount of fixations (b = -0.0003, t = -2.09, p = .037). Following Bauer and Curran's (2005) guidelines, we used a 'pick-a-point' approach to probe this three-way interaction. The continuous moderator variable (affect) was dichotomized to probe the conditional effects for relatively affect-poor (M - SD) and affect-rich (M + SD) lottery prizes. Two additional models with probability and monetary value as fixed effects were fitted separately for affect-rich and affect-poor lottery tickets. In cases of affect-rich lottery tickets, none of the main effects of predictors or their interactions were significant. Critically, we found a significant interaction of numerical characteristics of a lottery when affect-poor tickets were taken into account. Specifically, the number of fixations increased with higher levels of probability and monetary value of an outcome (b = 0.003, t= 2.67, p = .008).

Table 2. Linear mixed-effect model predicting the number of fixations and dwell time (square root transformation) in the area of interest from the subjective ratings of the intensity of affective responses (Affect), the monetary value of the lottery outcome (Value), probability (Prob.), and their interactions. Predictors were mean-centered before introducing them to the models

	Number of fixations			Dwell time		
Coefficient	Estimate	Std. error	t value	Estimate	Std. error	t value
Fixed						
Intercept	291.50	16.400	17.77**	34.310	1.8400	18.64**
Affect	0.1198	0.6939	0.17	−0.0295	0.0504	−0.59
Value	0.0494	0.0250	1.97*	0.0031	0.0018	1.73†
Prob.	0.1113	0.0450	2.47*	0.0058	0.0033	1.79†
Affect*Value	0.0010	0.0079	0.12	0.0003	0.0006	0.48
Affect*Prob.	0.0174	0.0138	1.26	0.0004	0.0010	0.36

	Number of fixations			Dwell time		
Coefficient	Estimate	Std. error	t value	Estimate	Std. error	t value
Value*Prob.	−0.0002	0.0005	−0.29	0.0001	0.0001	−0.23
Affect*Value*Prob.	−0.0003	0.0002	−2.09*	0.0001	0.0001	−1.23
Random effect	Variance			Variance		
Subject	4049.36			20.63		
Presentation side	76.55			0.67		
AOI type	128.51			4.42		
Residual	21621.64			113.94		

Note: † p < .1 * p < .05 ** p < .01

Discussion

Results of our study revealed that affect (here defined as the subjective ratings of the intensity of affective responses to a lottery prize) moderated the processing of the numerical characteristics of lotteries (i.e., payoffs and probabilities). Similarly to previous studies (Fiedler & Glöckner, 2012), the amount of attentional resources engaged in processing lotteries (measured by the number of fixations and dwell time in the present study) was positively associated with the probability and value of an outcome. Moreover, we found a significant interaction between probabilities and payoffs predicting the number of fixations, which suggests their integration, but only in processing of affect-poor lottery tickets. A corresponding pattern of results was not observed for affect-rich lottery tickets.

Our study is the first to demonstrate that the amount of attentional resources (measured by eye-tracking technology) engaged in cognitive processing of lotteries is moderated by their affective meaning. More fixations and longer dwell time in the payoff and probability AOIs suggest that participants paid more attention to this information during lottery inspection. We showed that attention to lotteries was sensitive to changes in the probabilities and monetary values assigned to lottery tickets, as is predicted by the multiplicative expected utility calculus. However, affect elicited by a lottery outcome moderated this interaction, suggesting that even if monetary values and probabilities are kept constant, affective reactions exert an influence on processing information about risky prospects (which is in line with the risk-as-feelings hypothesis, Loewenstein et al., 2001). Nevertheless, the psychological mechanism underpinning this process is less clear. There are at least two possible theoretical explanations for our findings. First, it is plausible that affect-laden imagery diminished sensitivity to variations in the probability scale (Rottenstreich & Hsee, 2001; Traczyk, Sobkow, & Zaleskiewicz, 2015) by changing the way in which a decision-maker translates objective probabilities to decision weights, i.e., the

shape of the probability weighting function (Fulawka & Traczyk, 2014; Petrova, van der Pligt, & Garcia-Retamero, 2014; Traczyk & Fulawka, 2016). With regard to the present study, mental images of lottery outcomes which are tagged by affect may contribute to a higher curvature of the non-linear inverse S-shape probability weighting function. As a result, when making a decision under intense affect, a decision-maker is able to detect changes only at the endpoints of the probability scale, i.e., from impossibility (0%) and to certainty (100%), while being insensitive to probability variations in midrange values (Gonzalez & Wu, 1999; Tversky & Kahneman, 1992). Second, it has recently been shown that an enhanced arousal level impairs feature binding in working memory (Mather et al., 2006). Assuming that affect elicited by a lottery outcome could increase arousal, we should also expect arousal-induced impairment of working memory performance in this case. Since the multiplication mechanism underlying the efficient combining of probabilities and payoffs to calculate expected utility demands more cognitive resources than comparison-based processing of probabilities and payoffs separately (Dehaene et al., 1996), affect-driven impaired working memory performance should guide choices to less effortful decision rules. Future studies are still needed to directly compare and test these two possible psychological mechanisms underpinning the decision process.

It seems that an interesting direction for future studies would be to include measures of individual differences in ability to comprehend and transform numerical information (i.e., numeracy; Peters & Bjalkebring, 2014). Crucially, people high in numeracy more frequently and efficiently incorporate probability information in the decision-making process (Peters et al., 2006), which results in more rational choices (Pachur & Galesic, 2013) probably through drawing more precise affective meaning from numbers (Petrova et al., 2014). To date, little is known about the exact link between attentional engagement to numerical information and numeracy. For instance, we could put forward a hypothesis according to which people high in numeracy (in comparison to low-numerate individuals) are more likely to base their choices on compensatory strategies. In the light of our results, they ought to integrate probability and payoff information more frequently, irrespectively of affective response to the lottery prize. On the other hand, such people are likely to adaptively use choice strategies and switch to fast and frugal heuristic processing (Traczyk, Sobkow, Fulawka, Kus, Petrova, & Garcia-Retamero, under review). Further research testing such predictions would be useful in understanding our results and, more importantly, in helping less numerate individuals to make accurate decisions.

The results of this study can also be used to gain insight into mechanisms of the gambling phenomenon. Therefore, they can be applied practically in developing more effective therapies for people addicted to gambling. Moreover, in line with our results, it seems important to construct and promote new, simplified methods of risk communi-

cation in affect-rich situations (e.g., speeding, gambling or choosing medical treatment) to help people make better everyday decisions.

To summarize, the current study demonstrated that the amount of attentional resources (measured be the number of eye fixations) engaged in the initial integration of probabilities and payoffs is moderated by the intensity of affective responses to a lottery prize. These results extend previous findings and offer a novel perspective on studying the role of affect in the decision-making process.

References:

Bates, D., Maechler, M., Bolker, B. M., & Walker, S. (2014). lme4: Linear mixed-effects models using Eigen and S4. R package version 1.1-7. Retrieved from http://cran.r-project.org/package=lme4

Bauer, D. J., & Curran, P. J. (2005). Probing Interactions in Fixed and Multilevel Regression: Inferential and Graphical Techniques. *Multivariate Behavioral Research, 40*(3), 373–400. doi:10.1207/s15327906mbr4003_5

Brandstätter, E., Gigerenzer, G., & Hertwig, R. (2006). The priority heuristic: making choices without trade-offs. *Psychological Review, 113*(2), 409–432. doi:10.1037/0033-295X.113.2.409

Dehaene, S., Tzourio, N., Frak, V., Raynaud, L., Cohen, L., Mehler, J., & Mazoyer, B. (1996). Cerebral activations during number multiplication and comparison: A PET study. *Neuropsychologia, 34*(11), 1097–1106. doi:10.1016/0028-3932(96)00027-9

Fiedler, S., & Glöckner, A. (2012). The dynamics of decision making in risky choice: an eye-tracking analysis. *Frontiers in Psychology, 3*, 1–18. doi:10.3389/fpsyg.2012.00335

Fulawka, K., & Traczyk, J. (2014). Wpływ negatywnego afektu na kształt funkcji wag decyzyjnych [Influence of negative affect on the shape of the probability weighting function]. *Psychologia Ekonomiczna [Polish Journal of Economic Psychology], 5*, 6–25. doi:10.15678/PJOEP.2014.05.01

Gonzalez, R., & Wu, G. (1999). On the shape of the probability weighting function. *Cognitive Psychology, 38*(1), 129–166. doi:10.1006/cogp.1998.0710

Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., & Weijer, J. van de. (2011). *Eye Tracking: A comprehensive guide to methods and measures*. Oxford: Oxford University Press.

Horstmann, N., Ahlgrimm, A., & Glöckner, A. (2009). How distinct are intuition and deliberation? An eye-tracking analysis of instruction-induced decision modes. *Judgment and Decision Making, 4*(5), 335–354.

Hsee, C. K., & Rottenstreich, Y. (2004). Music, pandas, and muggers: on the affective psychology of value. *Journal of Experimental Psychology: General, 133*(1), 23–30. doi:10.1037/0096-3445.133.1.23

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2014). lmerTest: Tests in Linear Mixed Effects Models. R package version 2.0-20. Retrieved from http://cran.r--project.org/package=lmerTest

Loewenstein, G., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*(2), 267–286. doi:10.1037//0033-2909.127.2.267

Mather, M., Mitchell, K. J., Raye, C. L., Novak, D. L., Greene, E. J., & Johnson, M. K. (2006). Emotional arousal can impair feature binding in working memory. *Journal of Cognitive Neuroscience, 18*, 614–625. doi:10.1162/jocn.2006.18.4.614

Pachur, T., & Galesic, M. (2013). Strategy Selection in Risky Choice: The Impact of Numeracy, Affect, and Cross-Cultural Differences. *Journal of Behavioral Decision Making, 26*(3), 260–271. doi:10.1002/bdm.1757

Pachur, T., Hertwig, R., & Wolkewitz, R. (2014). The affect gap in risky choice: Affect-rich outcomes attenuate attention to probability information. *Decision, 1*(1), 64–78. doi:10.1037/dec0000006

Peters, E., & Bjalkebring, P. (2014). Multiple Numeric Competencies: When a Number Is Not Just a Number. *Journal of Personality and Social Psychology*. doi:10.1037/pspp0000019

Peters, E., Vastfjall, D., Slovic, P., Mertz, C., Mazzocco, K., & Dickert, S. (2006). Numeracy and decision making. *Psychological Science, 17*(5), 407–413. doi:10.1111/j.1467-9280.2006.01720.x

Petrova, D. G., van der Pligt, J., & Garcia-Retamero, R. (2014). Feeling the Numbers: On the Interplay Between Risk, Affect, and Numeracy. *Journal of Behavioral Decision Making, 27*(3), 191–199. doi:10.1002/bdm.1803

R Core Team. (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria. Retrieved from http://www.r-project.org/

Rottenstreich, Y., & Hsee, C. K. (2001). Money, kisses, and electric shocks: On the affective psychology of risk. *Psychological Science, 12*(3), 185–190. doi: 10.1111/1467-9280.00334

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2007). The affect heuristic. *European Journal of Operational Research, 177*(3), 1333–1352. doi:10.1016/j.ejor.2005.04.006

Starmer, C. (2000). Developments in non-expected utility theory: The hunt for a descriptive theory of choice under risk. *Journal of Economic Literature, 38*(2), 332–382.

Traczyk, J., & Fulawka, K. (2016). Numeracy moderates the influence of task-irrelevant affect on probability weighting. *Cognition, 151*, 37–41. doi:10.1016/j.cognition.2016.03.002

Traczyk, J., Sobkow, A., Fulawka, K., Kus, J., Petrova, D., & Garcia-Retamero, R. (under review). Numerate Decision Makers Don't Use More Effortful Strategies Unless it Pays: A Process Tracing Investigation of Skilled and Adaptive Strategy Selection in Risky Decision Making.

Traczyk, J., Sobkow, A., & Zaleskiewicz, T. (2015). Affect-laden imagery and risk taking: The mediating role of stress and risk perception. *PLoS ONE, 10*(3), e0122226. doi:10.1371/journal.pone.0122226

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty, 5*(4), 297–323. doi:10.1007/BF00122574

Von Neumann, J., & Morgenstern, O. (1944). *Theory of Games and Economic Behavior*. Princeton: Princeton University Press.

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Adapting The Survey Of Perceived Organizational Support

Abstract

The subject of the present study was the Polish adaptation of the Survey of Perceived Organizational Support. The adapted scale demonstrates good psychometric properties, indicating high internal consistency. Construct validity was assessed using measures of job and life satisfaction, and a Work-Family Fit Questionnaire. The results have shown that the adapted scale is strongly positively correlated with felt satisfaction with work, and also demonstrates a positive, although weaker correlation with satisfaction with life. Correlations with the Work-Family Fit demonstrate that perceived organizational support is important for the relationship between professional and family roles when work is the source of influence. The results of the study indicate that the adapted SPOS can be successfully used in Poland.

Keywords

adaptation, perceived organizational support, work-family balance, job satisfaction, life satisfaction

Streszczenie

W prezentowanym badaniu przeprowadzono adaptację do warunków polskich skali Spostrzeganego Wsparcia Organizacyjnego. Uzyskała ona zadawalające wskaźniki psychometryczne, pokazujące wysoką jednorodność. Do zweryfikowania trafności teoretycznej użyto miar satysfakcji z pracy, satysfakcji z życia oraz kwestionariusza dopasowania praca-rodzina. Przebadano 293 pracowników biurowych. Wyniki wskazują, że adaptowana skala wiąże się silnie pozytywnie z odczuwaną satysfakcją

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z pracy oraz także pozytywnie, choć w słabiej, z satysfakcją z życia. Związki z dopasowaniem praca-rodzina pokazują, że odczuwane wsparcie organizacyjne jest istotne dla kształtowania relacji między rolą zawodową i rodzinną wtedy, gdy źródłem wpływu jest funkcjonowanie w pracy. Uzyskane rezultaty przekonują, że zaadaptowane narzędzie może być swobodnie używane w Polsce.

Słowa kluczowe

adaptacja, postrzegane wsparcie organizacyjne, równowaga praca-dom, satysfakcja z pracy, satysfakcja z życia

Introduction

Perceived organizational support (POS) is defined as the extent of employees' belief that an organization cares about them and their values, and protects them by offering help and support (Eisenberger, Huntington, Hutchison & Sowa, 1986). The organizational support theory (OST) claims that operating within any organization is a social exchange, which compels employees to help the organization meet its goals and to increase their work effort in return for rewards. Organizational support, as seen by employees, is a global phenomenon, and is not limited to any specific area of activity within an organization. An employee who feels supported believes that the organization is treating him with respect, recognizing his individual needs and limitations, appreciating the effort he puts into his work and the life of the organization, while willing to forgive mistakes or decreased productivity caused by, for example, sickness. The organizational support theory was developed on the basis of Blau's social exchange theory (1964) and empirical findings confirming a positive correlation between employees' work effort and their belief in the certainty and fairness of rewards.

After the publication of the Survey of Perceived Organizational Support by Eisenberger et al. (1986), numerous studies worldwide have demonstrated the significance of the construct and its relationship with both work-related and extraneous factors (Kurtessis, Eisenberger, Ford, Buffardi, Stewart & Adis, 2015).

Occupational research has shown that employees who receive organizational support perform better, feel more satisfied with their jobs (Eisenberger, Cummings, Armeli & Lynch, 1997), are more committed and attached to their job (Eisenberger & Stinglhamber, 2011), and are at a lower risk of burnout (Kang, Twigg & Hertzman, 2010).

POS is also associated with employees' emotions and well-being. There have been reports of significant correlations between POS and general health (Bradley & Cartwright, 2002), the number of somatic symptom complaints (Dupre & Day, 2007), anger levels (O'Neill, Vandenberg, Dejoy & Wilson, 2009), stress and levels of self-esteem (George, Reed, Ballard, Colin & Fielding, 1993). Furthermore, POS serves as emotional buffer for negative emotions arising from role conflict (Jawahar, Stone & Kisamore, 2007).

POS has also been shown to be related to factors outside of work, such as employees' psychological well-being (Aggarwell-Gupta, Vohra & Bhatnager, 2010), life satisfaction (Dixon & Sagas, 2007), and finding balance between work and family roles (Greenhaus & Beutell, 1985).

Despite many years of prominence in international literature on organization and work, OST had not come to the attention of researchers in Poland. This is why we decided to adapt the instrument (*Survey of Perceived Organizational Support* – SPOS). To assess the validity of the construct, we decided to test the correlation (confirmed in international studies) between POS and satisfaction with work and life, and achieving balance between familial and professional roles. The work-family interference denotes the effects of work on an employee's private life. Its dynamics depend both on the person involved in professional activity and the work environment in general: work conditions and hours, interpersonal relations with colleagues at all levels of the organization and subjective job satisfaction (Frone, Yardley, Markel, 1997). As for the family-work interference, it works in the opposite direction: the term describes the effects of family relations on an employee's professional life. Role spillover may be negative (conflict) or positive (facilitation), depending on the resources at the employee's disposal, the way he/she uses them in various domains of activity, and the external requirements at work and in their private life (Lachowska, 2008; Grzywacz, Bass, 2003). Research has shown (Grzywacz, Butler, 2005) that a positive work-family and family-work facilitation (when there is an absence of unwanted role conflict) is more likely to occur when the employee has at his disposal resources such as professional experience, so-called "hard" and interpersonal skills, and opportunities created by his place of employment and family situation.

One of the key factors mentioned in the context of work-private life interference is the organizational culture at the workplace (Major, Klein, Ehrhart, 2002). Both the demands placed on employees and the organization-dependent factors that stimulate employees' commitment to work are considered significant. POS, defined as the assessment of company policy towards its employees, determines the workforce's commitment to the tasks performed and shapes their work-related emotions (Rhoades, Eisenberger, 2002).

Since the direction of influence is established in the conflict and interference theory, correlations were expected between the magnitude of POS and the measures of work-family facilitation and conflict, as they refer to the effects of the work situation on family life (Lachowska, 2012). The definition of POS includes the assessment of employee-organization relations determined by the rules implemented at the company and the characteristics of employees. Private life experiences are not assumed to affect those relations (Eisenberger, Huntington, Hutchinson, Sowa, 1986). Therefore, the presence of a relationship between POS and conflict or facilitation from family to professional life is unlikely.

The main purpose of the study was to prepare the Polish adaptation of SPOS. Growing interest in work and organizational psychology provided the motivation for introducing this well-known and widely used instrument in Poland.

Correlations were also expected with measures of satisfaction and the successful balancing of professional and family roles. Consequently, the following hypotheses have been proposed:

1. Perceived organizational support will be positively correlated with job satisfaction and life satisfaction; the former relationship will be stronger than the latter.
2. Perceived organizational support will be positively correlated with the magnitude of work-family facilitation and negatively correlated with the severity of work-family conflict; there will be no relationships with the magnitude of family-to-work conflict or facilitation.

Materials and Methods

Perceived Organizational Support. POS was measured using the Polish translation of SPOS (Eisenberger et al., 1986), which consists of 33 items. Respondents indicated the extent to which they agreed with each item on a seven-point Likert scale ranging from "strongly agree" to "strongly disagree". The items were first translated into Polish by a researcher based at the Faculty of Psychology, and then back-translated by an English translator. The back-translated version closely matched the original. The SPOS was translated into Polish with the grammatical form of items preserved, so that negatives in the original version were retained in the translation, with responses to those items subsequently recoded. The structure of the response scale and the sequence of items was also preserved.

Job Satisfaction. Job satisfaction was measured using the scale of six items that refer to the six components of satisfaction (Czarnota-Bojarska, 2010). These components are: amount of earnings, possibility of advancement, self-reliance at work, learning opportunities, relations with superiors and sense of employment stability (cf. Locke, 1976; Smith, Kendall, & Hulin, 1969). Participants responded on a 7-point Likert scale, from 1 (*I am very dissatisfied*) to 7 (*I am very satisfied*). The overall result is calculated by adding up the points and dividing the sum by the number of items in the questionnaire. The higher the overall score, the higher the level of job satisfaction. The internal reliability of the questionnaire measured by Cronbach's alpha coefficients is 0.82.

Life Satisfaction. Life satisfaction was measured using the Satisfaction with? Life Scale (Diener, Emmons, Larsen & Griffin, 1985) adapted into Polish by Jankowski (2012). Rather than measuring specific satisfaction domains, the instrument assesses life satisfaction as a cognitive-judgmental process. The scale consists of five items with answers

given on a seven-point Likert scale, from 1 (*I definitely agree*) to 7 (*I definitely disagree*). The overall result is calculated by adding up the points and dividing the sum by the number of items in the questionnaire. The internal reliability of the questionnaire measured by Cronbach's alpha coefficients is 0.89.

Work-Family Balance. The Work-Family Fit Questionnaire (Grzywacz, Bass, 2003) is an instrument based on a two-dimensional model of interference between professional and family life. The model accounts for the type of influence (conflict or facilitation) and its direction (work affecting family or family affecting work). This yields the four scales of the questionnaire: 1) work-family conflict; 2) work-family facilitation; 3) family-work conflict; 4) family-work facilitation. The model has been validated empirically in Poland (Lachowska, 2005; Lachowska, 2008). The internal reliability of the questionnaire measured by Cronbach's alpha coefficients is 0.69. The reliability values for individual scales in the original are as follows: 1) work-family conflict: 0.82; 2) work-family facilitation: 0.73; 3) family-work conflict: 0.80; 4) family-work facilitation: 0.70 (Grzywacz & Bass, 2003). The reliability values for the Polish version are: 1) work-family conflict: 0.81; 2) work-family facilitation: 0.78; 3) family-work conflict: 0.74; 4) family-work facilitation: 0.72 (Lachowska, 2012). Participants responded on a 5-point scale, from 1 (*never*) to 7 (*all the time, almost always*). The overall result is calculated by adding up the points and dividing the sum by the number of items in each scales of 4.

Procedure

The study group included 293 office workers aged between 17 and 68 years (M = 39 years, standard deviation [SD] = 10.88), with average work experience of 16 years and 8 months (SD = 11.22), and a mean time working for their current employer of 9 years and 11 months (SD = 8.17). All the subjects were recruited in 6 companies. Instructions explained the purpose of the study and the use of its results and informed potential participants that they could obtain the results by emailing the researcher . Participants completed sets of measures on an individual basis. In order to ensure anonymity, subjects placed their completed measures in envelopes and handed them to a co-worker affiliated to the researcher .

Results

Psychometric properties of SPOS. The first step was the Principal Components Analysis. It showed that the first factor accounted for 39.13% of the total variance, and the five remaining identified factors accounted for between 6.98% and 2.98% of the total variance. This indicates a very steep scree plot. The analysis of factor loadings for individual items showed

that only in five cases was the loading on the first factor lower than on any of the remaining factors. The findings validate the categorization of SPOS as a one-factor scale.

The following items had the highest factor loadings: "The organization cares about my general satisfaction at work", "The organization really cares about my well-being", "Even if I did the best job possible, the organization would fail to notice"(R), "The organization is willing to extend itself in order to help me perform my job to the best of my ability".

The scale's internal consistency was also assessed. Cronbach's alpha for the whole scale was 0.952, indicating strong internal consistency. The correlations between individual items and the remainder of the scale ranged between 0.288 and 0.805; any single item could be removed without altering the total variance. In the original version, Cronbach's alpha was 0.97 for the whole scale, with correlations between items ranging from 0.42 to 0.83 (Eisenberger, Huntington, Hutchison & Sowa, 1986).

Validity

One of the intended methods for verifying the validity of the adapted scale was to test its correlations with job satisfaction. The correlation with the overall satisfaction index was $r = 0.732$ ($p < .000$). The relations with individual components of satisfaction were also calculated. Due to the nature of the measurement, Spearman's rank correlation coefficient (*rho*) was used. The highest values were obtained for the correlation between POS and satisfaction with possibilities of advancement and opportunities for learning and gaining new skills. All the values are shown in Table 1.

Table 1. Correlation between job satisfaction and perceived organizational support

Job satisfaction component:	Perceived organizational support
Amount of earnings	.572***
Possibility of promotion	.651***
Self-reliance at work / task performance	.454***
Opportunities for learning / gaining new skills	.629***
Relationships with superiors	.481***
Employment assurance / sense of employment stability	.356***

Probability note.
* $p < .05$; ** $p < .01$; *** $p < .001$

The relationship between POS and life satisfaction was $r = 0.461$ ($p < .000$), i.e. weaker than the correlation with overall job satisfaction and with most of the components of job satisfaction that were assessed, thus confirming our expectations.

Relationships were also predicted between the magnitude of work-family conflict and facilitation, with no hypothesized correlation between the magnitude of family-to-work conflict or facilitation. These hypotheses were fully confirmed, as shown in Table 2.

Table 2. Correlation between work-family balance and perceived organizational support

Interference direction	Type of interference	Perceived organizational support
Work – family	Conflict	−.336**
	Facilitation	.261**
Family – work	Conflict	−.012
	Facilitation	.088

Probability note.
* $p < .05$; ** $p < .01$; *** $p < .001$. (one tailed).

POS is important for the relationship between professional and family roles when work relations are the source of influence. The correlations are similarly significant for both conflict- and facilitation-type relations, although, obviously, the correlation is positive for facilitation and negative for conflict. When the source of relationship is family functioning, perceived organizational support is no longer significant either for conflict or for the facilitation of roles between the two domains.

Discussion

The present study demonstrated that the Survey of Perceived Organizational Support can be used for research purposes in Poland. The instrument has good psychometric properties and shows the expected relationships with other measures.

Of note are the relationships between POS and relations between professional and family roles. In the present study, conflict and facilitation between those roles were assessed, and the source of interference (work or family life) was determined. The results confirmed the prediction that POS is significant when the source of conflict or facilitation between roles is work, and non-significant when the influence stems from a person's private life. This is consistent with many previous reports (Casper, Martin, Buffardi & Edwins, 2002; Dixon & Sagas, 2007; Foley, Hang-Yue & Lui, 2005; McNall, Masuda, Shanock, Nicklin, 2011; Shaffer, Harrison, Gilley & Luk, 2001).

The implications are important both for research associated with the work-family and family-work balance, and for the functioning of organizations . Firstly, the identification of the direction of influence between the roles is justified and reflected in the findings. Despite the relationships between the subjective severity of work-family and family-work conflict and the extent of work-family and family-work facilitation, perceived organization-

al support is only significantly correlated with work-family conflict and facilitation. Secondly, our findings indicate specific, although limited, means by which organizations can help their employees reduce conflicts and enhance the facilitation of their work and family roles. Efforts to boost perceived organizational support help achieve the work-family balance, but make very little difference to perceived family-work conflict or facilitation.

With the covariance of POS and the work-family and family-work conflict and facilitation observed in the study, it seems reasonable to focus attention on employee-related factors that may affect the occurrence of conflict and facilitation. There have been studies on the effects of personality within the "Big Five" model on the magnitude of interference between work and private life (Allen, Johnson, Saboe, Cho, Dumani, Evans, 2012; Blanch, Aluja, 2009; Boyar, Mosley, 2007; Michel, Clark, Jaramillo, 2011; Wayne, Musisca, Fleeson, 2004). Perhaps with more data on the differences between individuals with significant work-family spillover and those for whom family-work spillover is dominant, we will be able to explain in more detail the relationships between POS and the effects of work on people's private life.

POS is also positively correlated with job satisfaction, as confirmed by other empirical findings in this area (Dixon & Sagas, 2007; Eisenberger, Cummings, Armeli & Lynch, 1997). Among the components of satisfaction which were tested the highest correlation coefficients were obtained for satisfaction with the possibility of promotion and opportunities for learning and development. This shows the importance of POS, especially for those aspects that enhance ties with the organization and encourage the building of a career within its structure. One valid conclusion is that support is most effective when the organization provides employees with opportunities for self-fulfillment and the improvement of their professional status . Today the need to keep pace with new developments and expand one's competences seems obvious. Employees who feel supported by their organization are probably more willing to engage in training that brings them personal satisfaction. In addition, research has shown that employees who experience organizational support, and, consequently, job satisfaction, want to make use of the knowledge and skills they absorb in training (Zumrah & Boyle, 2015).

The main purpose of the present study was to adapt the Survey of Perceived Organizational Support for use in Poland. This goal has been met. As a result, Polish organizational psychology has gained a new instrument, one that is widely used internationally and that measures a construct of key importance to a wide range of hypotheses.

References:

Allen, T. D., Johnson, R. C., Saboe, K. N., Cho, E., Dumani, S.,& Evans, S. (2012). Dispositional variables and work – family conflict: A meta – analysis. Journal of Vocational Behavior, 80, 17 – 26.

Blanch, A.,& Aluja, A. (2009). Work family and personality: A study of work – family conflict. *Personality and Individual Differences, 46*, 520 – 524.

Blau, P. M. (1964). Distinctions between social support concepts, measures and models. *American Journal of Community Psychology, 14*, 413 – 445.

Bradley, J.,& Cartwright, S. (2002). Social support, job stress, health and job satisfaction among nurses in the United Kingdom. *International Journal of Stress Management, 9*, 163 – 182.

Casper, W.J., Martin, J.A., Buffardi, L.C., & Edwins, C. (2002). Work family conflict, perceived organizational support, and organizational commitment among employed mothers. *Journal of Occupational Health Psychology, 7*, 99 – 108.

Czarnota-Bojarska, J. (2010). *Dopasowanie człowiek – organizacja i tożsamość organizacyjna*. [Person-Organization Fit and organizational identity] Warszawa: Wydawnictwo Naukowe Scholar.

Diener, E., Emmons, R. A, Larsen, R. J.,& Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment,49*, 71 – 75.

Dixon, M.A. & Sagas, M. (2007). The relationship between organizational support, work –family conflict, and the job-life satisfaction of University coaches. *Research Quarterly for Exercise and Sport, 78 (3),* 236 – 247.

Dupre, K.,& Day, A. (2007). The effects of supportive management and job quality on the turnover intentions and health of military personnel. *Human Resource Management, 46*, 185 – 201.

Eisenberger, R., Cummings, J., Armeli, S.,& Lynch, P. (1997). Perceived organizational support, discretionary treatment,and job satisfaction. *Journal of Applied Psychology, 82*, 812 – 820.

Eisenberger, R., Huntington, R., Hutchison, S.,& Sowa, D. (1986). Perceived organizational support. *Journal of Applied Psychology,71*, 500 – 507.

Eisenberger, R.,& Stinglhamber, F. (2011). *Perceived organizational support: Fostering enthusiastic and productive employees*. Washington, DC: American Psychological Association.

Frone, M. R., Yardley, J. K.,& Markel, K. S. (1997). Developing and testing an integrative model of the work-family interface. *Journal of Vocational Behaviour, 50*, 145 – 167.

George, J.M., Reed, T.F., Ballard, K.A., Colin, J.,& Fielding, J. (1993). Contact with AIDS patients as a source of work-related distress: Effects of organizational and social support. *Academy of Management Journal, 36*, 157 – 171.

Greenhaus, J. H.,& Beutell, N. J. (1985). Sources of conflict between work and family roles. *Academy of Management Review, 10*, 76 – 88.

Grzywacz, J. G.,& Butler, A. B. (2005). The impact of job characteristics on work-to-family facilitation: Testing a theory and distinguishing a construct. *Journal of Occupational Health Psychology, 10*, 97 – 109.

Grzywacz J.G.,& Bass B.L. (2003), Work, Family, and Mental Health: Testing Different Models of Work-Family Fit. *Journal of Marriage and Family, 65*, 248 – 262

Jankowski, K. S. (2012). Morningness/eveningness and satisfaction with life in a Polish sample. *Chronobiology International, 29 (6),* 780 – 785.

Jawahar, I.M., Stone, T.H.,& Kisamore, J.L. (2007). Role conflict and burnout: The direct and moderating effects of political skill and perceived organizational support on burnout dimensions. *International Journal of Stress Management, 14 (2)*, 142 – 159.

Kang, B., Twigg, N. W.,& Hertzman, J. (2010). An examination of social support and social identity factors and their relationships to certified chef's burnout. *International Journal of Hospitality Management, 29,* 168 – 176.

Kurtessis, J.N., Eisenberger, R., Ford, M.T., Buffardi, L.C., Stewart, K.A. & Adis, C.S. (Published online March 2015). Perceived Organizational Support: Meta-Analytic Evaluation of Organizational Support Theory. *Journal of Management*.

Lachowska, B. (2012). Konflikt i facylitacja między rolami rodzinnymi i zawodowymi a jakość życia pracujących rodziców [Conflict and facilitation between family and professional roles and the quality of life of working parents]. *Psychologia Społeczna, 4(23)*, 353 – 371.

Lachowska, B. (2012). *Praca i rodzina. Konflikt czy synergia. Konflikt i facylitacja między rolami rodzinnymi i zawodowymi – uwarunkowania i znaczenie dla jakości życia kobiet i mężczyzn* [Work and family. Conflict or synergy? Conflict and facilitation between family and professional roles: determinants and importance for women's and men's quality of life], Lublin: Wydawnictwo KUL.

Lachowska, B. (2008). Człowiek dorosły wobec wymagań związanych z funkcjonowaniem w różnych sferach życia: zawodowej i rodzinnej [Adults and the requirements associated with functioning in professional and family life]. *Psychologia Rozwojowa, 1*, 101 – 114.

Locke, E. A. (1976). The nature and causes of job satisfaction. In M. D. Dunnette (Ed.), *Handbook of Industrial and Organizational Psychology*, Chicago: Rand McNally, 1297 – 1349.

Major, S.M., Klein, K.J.,& Ehrhart, M.G. (2002). Work time, work interference with family and psychological distress. *Journal of Applied Psychology*, *87(3)*, 427 – 436.

McNall, L.A., Masuda, A.D., Shanock, L.R.,& Nicklin, J.M. (2011). Interaction of Core Self–Evaluations and Perceived Organizational Support on Work-to-Family Enrichment. *The Journal of Psychology: Interdisciplinary and Applied,* 145, 2, 133 – 149.

Michel, J. S., Clark, M. A.,& Jaramillo, D. (2011). The role of the Five Factor Model of personality in the perceptions of negative and positive forms of work-nonwork spillover: A meta – analytic review. *Journal of Vocational Behavior, 79*, 191 – 203.

O'Neill, O.A., Vandenberg, R.J., DeJoy, D.M.,& Wilson, M. G. (2009). Exploring relationships among anger, perceived organizational support, and workplace outcomes. *Journal of Occupational Health Psychology, 14*(3), 318 – 333.

Rhoades, L.,& Eisenberger, R. (2002). Perceived Organizational Support: A review of the Literature. *Journal of Applied Psychology*, *87(4)*, 698 – 714.

Shaffer, M. A., Harrison, D. A., Gilley, K. M., & Luk, D. (2001). Struggling for balance amid turbulence: Work, family, and commitment on international assignments. *Journal of Management, 27*, 100 – 121.

Smith, P.C., L.M. Kendall, & C.L. Hulin (1969). *The Measurement of Satisfaction in Work and Retirement*. Chicago: Rand McNally.

Wayne, J. H., Musisca, N.,& Fleeson, W. (2004). Considering the role of personality in the work–family experience: Relationships of the big five to work-family conflict and facilitation. *Journal of Vocational Behavior, 64,* 108 – 130.

Zumrah, A.R.&Boyle, S. (2015). The effects of perceived organizational support and job satisfaction on transfer of training. *Personnel Review, 44 (2)*, 236 – 254.

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The sense of body boundaries – subjective determinants and implications for body self-relation in people with psychosomatic illnesses

Abstract

This article seeks to explore the determinants of the sense of body boundaries and its implications for body self- relation in psychosomatic patients – patients with irritable bowel syndrome (IBS) as well as psoriasis and atopic dermatitis. Stepwise regression analysis and paths analysis were carried out. The most significant condition affecting the strength of the sense of body boundaries among IBS patients is their sensitivity to the violation of self- boundaries in the dimension of the social self. Likewise, among patients with skin diseases, the most important factor is their style of cognitive functioning (field independence). Furthermore, both similarities and differences have been found in the groups involved in the research in terms of determinants of the sense of body boundaries, as well as in comparison with the results from healthy patients. The results which were obtained indicated that the greater the strength of the sense of body boundaries in IBS patients, the greater its positive impact on the assessment of the patients' own health, their physical attractiveness and comfort from touch, in a similar way to that in healthy people. As far as patients with psoriasis and atopic dermatitis are concerned, the sense of body boundaries was revealed to have a positive impact on the level of health orientation: active involvement with either maintaining or improving the health condition.

Keywords

Sense of body boundaries, body self- relation, irritable bowel syndrome, psoriasis, atopic dermatitis, health condition

Streszczenie

Dążono do poznania uwarunkowań poczucia granic ciała i jego następstw dla relacji z ciałem u osób chorych psychosomatycznie - z zespołem jelita nadwrażliwego oraz z łuszczycą i atopowym zapaleniem skóry. Wykonano analizę regresji metodą krokową i analizę ścieżek. U osób z IBS najważniejszym uwarunkowaniem siły poczucia granic ciała jest wrażliwość na naruszenie granic Ja w wymia-

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rze Ja społecznego, a u osób z chorobami skóry – styl funkcjonowania poznawczego (niezależność od pola). Ponadto stwierdzono, że w badanych grupach istnieją zarówno podobieństwa, jak i różnice w zakresie uwarunkowań poczucia granic ciała, także w zestawieniu z wynikami osób zdrowych. Uzyskane rezultaty wskazały, że im większa jest siła poczucia granic ciała u osób z IBS, tym większy jest jej pozytywny wpływ na ocenę własnego zdrowia i atrakcyjności fizycznej, a także komfortu w dotyku, podobnie jak u osób zdrowych. U osób z łuszczycą i atopowym zapaleniem skóry poczucie granic ciała okazało się istotnie wpływać na poziom zorientowania na zdrowie: aktywne zaangażowanie w utrzymanie lub poprawę kondycji zdrowotnej.

Słowa kluczowe

poczucie granic ciała, relacja z ciałem, zespół jelita nadwrażliwego, łuszczyca, atopowe zapalenie skóry, kondycja zdrowotna

Introduction

The aim of this study was to recognise the subjective determinants of the sense of body boundaries and to establish its after-effects on the health condition of psychosomatic patients.

The sense of body boundaries is variously defined in literature (Krzewska, Dolińska-Zygmunt, 2012; Krzewska, 2015). Its definitions seem to be well integrated in the barrier concept (Fisher and Cleveland, 1956; 1958; Fisher,1960; Cleveland, 1960; Fisher, 1963; 1970; S.Fisher and R.Fisher, 1964). According to these authors, the sense of body boundaries is the cognitively-emotional experience of one's own bodily surface in terms of barrier and permeability . The sense of barrier is a relatively constant sense of a person's own physical separateness from the environment, while the sense of permeability is a sense of physical vulnerability to violation, connected with fear for one's own physical safety. The barrier dimension as well as the dimension of permeability of boundaries, based on the intensity in each individual case, are the components of the strength of the sense of body boundaries.[3]

Psycho-dynamic-developmental concepts indicate the fundamental importance of the sense of body boundaries on a person's personality and the growth of their identity (Krueger, 1989, 1990, 2002; Kowalik, 2003, Allport, 1998, James, 1890, Grotstein, 1980, after: Sakson-Obada 2009). This fact also implies the considerable role played by the sense of body boundaries in the shaping of a health condition. (Fisher, Cleveland, 1958; Fisher, 1971, Krzewska, Dolińska-Zygmunt, 2012; Krzewska, Ruda, Rymaszewska, 2012).

In accordance with psycho-dynamic concepts, the sense of body boundaries is conditioned by interoception, which means the body signals' perception is the basis of one's

[3] The stronger the sense of the barrier of body boundaries (separateness from the environment) and the weaker the sense of permeability (susceptibility to violation), the greater the power of the sense of body boundaries.

own feeling as a separate unit from the environment. This feeling increases with a parent's touch (Krueger 1989, 2002; Anzieu, 1979; Meloney, 1957, after: Sakson-Obada, 2007). Fisher and Cleveland (1958) postulated that people differ in the intensity of their perception of the signals from the surface and from the inside of the body. That results in the concentration of attention on those body areas in which the availability of experience is more intense (Fisher and Cleveland, 1958, Reich, 1949, after: Fisher, 1960). The references to the degree of attention on the body's surface has also been analysed by several Polish authors (Wolak, 1989; Wycisk, 2004; Sakson-Obada, 2009).

The ability to differentiate between one's own body and the environment has been considered in terms of field dependence / independence – the style in which the individual receives and processes incoming information. The cognitive style that is independent from the field means the ease of the differentiation of the field fragments against the totality, whereas, the style that is dependent on the field means the difficulty in maintening of the portion of the field (e.g. an object or target) against the background of the totality (Witkin, Goodenough, Oltman, 1979, Matczak, 2000; Nosal, 1990; Strelau, 2006, after: Bednarek, Truszczyński, 2010). The research presents the idea that the degree of independence from the field can be manifested by the style of experiencing one's own body as an object of a separate environment[4] (Witkin, 1968); however, in this understanding, it seems to be ambiguously related to the sense of body boundaries from Fisher's point of view (the barrier aspect) (Fisher, 1970; Fisher, 1990, Shontz 1969). Equivalently to the sense of body boundaries in Fisher's and Cleveland's viewpoint (1956), independence from the field seems to be connected with some personality traits and health issues (Witkin, 1968).

It creates the impression that the sense of body boundaries may be dependent on individual differences in the need for cognitive closure (Webster, Kruglansky, 1994, after: Kossowska, Hanusz, Trejtowicz, 2012), which means the tendency to search for clear and certain knowledge. People with a high need for cognitive closure are featured as decided, orderly and solid; they prefer predictability and they usually do not tolerate ambiguity. Moreover, they can be called as intellectually "closed". The disposition described above should be manifested by the way of experiencing the body: as an integral whole or an open, ambiguous space.

Another psychological phenomenon that is related to the sense of body boundaries as analysed by Fisher and Cleveland (1956) is the level of sensitivity to the violation of self- boundaries (Burris and Rempel, 2004, after: Jaśkiewicz and Drat-Ruszczak, 2011): the recognition and protection of one's own boundaries in bodily, social and territorial-symbolic terms.

[4] Together with independence from the field, some changes occur, e.g. the ability of the people being examined to determine the position of the body in a dark room – based on signals coming from the body.

After-effects of the sense of body boundaries

The literature indicates that the sense of body boundaries adjusts the relation of an individual to his/her own body (Krueger, 2002ab, Mirucka, 2003ab, Kowalik, 2003; Sakson-Obada, 2009; Sakson-Obada, Mirucka, 2013) and carries significant implications for a human's health condition (Krzewska, Dolińska-Zygmunt, 2013). A weakened sense of body boundaries is described, among others, in schizophrenia-related disorders (Rohricht, Priebe, 2001,2002), personality disorders (like borderline) (Sakson-Obada, 2003), among victims of trauma and emotional violence (Wycisk, 2004) and also among obese people (Geiger, Magyar, 1978).

Fisher and Cleveland (1956, 1958) illustrated that the strength of the sense of body boundaries allows for the prediction of symptoms of psychosomatic disease[5] with regard to where they occur in the body (on the surface or inside). In the research by the authors mentioned above, patients with dermatitis had higher barrier indicators and, at the same time, lower permeability indicators, compared to patients with peptic ulcers (Fisher and Cleveland, 1954, after: Fisher, Cleveland, 1956). Other authors have not confirmed these findings among the people they examined who had psychosomatic diseases in the areas of the skin, the stomach and the urogenital system (Eigenbrode and Shipman, 1960; Hirt and Kurtz, 1969). Certain data suggests that the sense of body boundaries can be considered in categories of health potential, due to the fact that its greater strength is associated with a greater ability to control emotions (Brodie, 1959 after: Fisher, 1963); and furthermore with a greater ability to cope with stress (Fisher, 1963).

The literature indicates that the sense of body boundaries may be an important condition for health self-assessment (Fisher and Cleveland, 1958; Fisher, 1963; Krzewska, Ruda and Rymaszewska, 2012), physical fitness (Fisher, 1970) and attractiveness (Wycisk, 2004; Mirucka, 2006; Sakson-Obada, 2009; Krzewska, 2012, Ruda, Krzewska, Rymaszewska, Koczanowicz, 2013), as well as involvement in these spheres.

It has been frequently claimed that the sense of body boundaries has a role in building a sense of comfort in touch. This role is noted in issues of both health and illness (Wycisk, 2004; Sakson-Obada, 2009; Krzewska, 2012; Ruda, Krzewska, Rymaszewska, Koczanowicz, 2013). Patients with an increased sense of boundaries, in Fisher's understanding, are attributed with having a high degree of openness to communication, a more advanced tendency to interact (Fisher and Cleveland, 1971) and greater ease of interactive functioning as well as spontaneous expression (Fisher, 1963; Ramer, after: Fisher, 1963).

[5] The authors do not give one accepted definition of psychosomatic disease.

Materials and Methods

Based on the literature, two major research problems were formulated [6]:

1. What are the conditions affecting the sense of body boundaries among the patients with psychosomatic diseases: irritable bowel syndrome, psoriasis and atopic dermatitis?

   Among determinants of the sense of body boundaries the following variables were analysed: style of cognitive functioning, concentration of attention on the body surface, insensitivity of proprioception, need of cognitive closure, sensitivity to the violation of boundaries

2. What are the after-effects of the sense of body boundaries for body relations among psychosomatically[7] ill patients with irritable bowel syndrome, psoriasis and atopic dermatitis?

   The following implications of the sense of body boundaries for body self- relation were analysed: appearance evaluation and orientation, physical fitness evaluation and orientation, health evaluation and orientation (health care), disease orientation (sensitivity to the symptoms of the illness)

Variables and methods[8,9] for the main research problems were presented in charts 1 and 2.

[6] The results of the patients will be discussed in relation to earlier studies conducted among healthy people – because of the amplitude of the latter studies, it was decided not to present them in the present study. However, they have been widely discussed in a separate publication (Krzewska, Dolińska-Zygmunt, 2016).

[7] The following thesis is focused on those psychosomatic illnesses which are manifested by two arbitrarily defined types of symptoms: symptoms involving the external parts of the body (due to their function, the symptoms that remain in continuous, direct physical contact with the outside world or are subjected to the will) or symptoms involving internal parts of the body (that are not subjected to the will and do not remain in continuous, direct physical contact with the outside world). Attention was concentrated on psychosomatic illnesses in the field of dermatology and gastroenterology. For practical reasons (unambiguous recognition, the availability of patients), atopic skin dermatitis, psoriasis and irritable bowel syndrome were chosen. The following diseases were selected because of the similarities in their unclear and multiple etiology (genetics are mentioned, among others). The diseases which were analysed also do not have a clearly psychogenic etiology. The clear influence of psychological factors on the course of these illnesses is stressed, so that they are described as the psychosomatic diseases.

[8] Variable: the sense of body boundaries can be both dependent and independent – depending on the stage of the research.

[9] The description of the author's research tools can be found in the publication by Krzewska and Dolińska-Zygmunt, 2016

Chart 1. Dependent variables

Variable	Indicator	Tool
The sense of body boundaries: – The strength of the sense of body boundaries – Barrier – Permeability	The answers in the questionnaire – the numerical results	The Sense of Body Boundaries Questionnaire (Kwestionariusz Poczucia Granic Ciała) **KPGC** (Krzewska I., Dolińska-Zygmunt G., 2013)
Comfort in touch	The answers in the questionnaire – the numerical results	The Body Investment Scale, **BIS**, (Orbach I., Mikulincer M., 1998, trans. B. Lewandowska) sub-scale: comfort from touch
The relation with one's own body: – Appearance evaluation – Appearance orientation – Physical fitness evaluation – Physical fitness orientation – Health evaluation – Health orientation (health care) – Disease orientation (sensitivity to the symptoms of the illness)	The answers in the questionnaire – the numerical results	Multidimensional Body Self Relations Questionnaire, **MBSRQ,** Cash, 2000, trans. Schier and others 2009, sub-scales in accordance with the particular variables

Chart 2. Independent variables

Variable	Indicator	Implement
The sense of body boundaries: – The strength of the sense of body boundaries – the global result – Barrier – Permeability	The answers in the questionnaire – the numerical results	The Sense of Body Boundaries Questionnaire (Kwestionariusz Poczucia Granic Ciała) **KPGC** (Krzewska, Dolińska-Zygmunt, 2013)
The style of cognitive functioning according to Witkin – the range of independence from the field	The amount of correctly performed test tasks in a given time period	Group Embedded Figure Test, **GEFT** (Witkin H.A., Oltman P.K., Raskin E., Karp S.A.,1971, 2002).
The concentration of attention on the body surface	The percentage participation of answers of an "external" type in the procedure of asking the examined people about the body parts which they think about more frequently thanothers.	The Scale of Paying Attention to the Body Surface (Skala Koncentracji Uwagi na Powierzchni Ciała) **SKUPC**, the author's method
The insensitivity of proprioception	The amount of the spontaneously reported experiences from the body by the examined person in the situation of a short period of relaxation	The report of the Signals from the Body (Raport Sygnałów z Ciała) **RSC** (the author's method, based on Fisher, 1965; Sakson-Obada, 2009)

Variable	Indicator	Implement
The need of cognitive closure: – the intensity of the need of cognitive closure, – order preference, – predictability preference, – intolerance of ambiguity, – mental closeness, – decisiveness	The answers in the questionnaire – the numerical results	Need for Cognitive Closure Scale (Skala Potrzeby Poznawczego Domknięcia) **SPPD** – shorten version (Kossowska, Hanusz, Trejtowicz, 2012, based on: Kruglansky, Webster, 1994)
The sensitivity to the violation of the boundaries: – global self- result – corporal self: discomfort in the situation of the violation of the body boundaries – social self: discomfort in the situation of the risk of social rejection – symbolic-territorial self: discomfort in the situation of the loss of the environment characters connected with the sense of identity	The answers in the questionnaire – the numerical results	**Amoebic Self Scale**, **SNaG** (Burris, Rempel, 2004, Polish adaptation Jaśkiewicz, Drat-Ruszczak, 2011)

The subjects who were examined:

People with psychosomatic diseases with symptoms in the area of the digestive system: diagnosed with IBS (Irritable Bowel Syndrome) (Chart 3,4)

People with psychosomatic diseases with symptoms on the skin : diagnosed with psoriasis and atopic dermatitis (Chart 3,4).

Chart 3. The descriptive statistics for the participants of the study

	Irritable Bowel Syndrome	Psoriasis, Atopic Skin Dermatitis
N	56	56
Age range	21-65	19-65
Age average	38,17	39,31
Women	46	48
Men	10	8

Chart 4. The descriptive statistics for the people examined

		N	Average	Standard deviation
The strength of the sense of body boundaries	irritable bowel syndrome	56	67,34	14,32
	psoriasis and atopic skin dermatitis	56	66,07	13,18
Barrier	irritable bowel syndrome	56	24,98	5,28
	psoriasis and atopic skin dermatitis	56	24,43	4,68
Permeability	irritable bowel syndrome	56	42,36	9,87
	psoriasis and atopic skin dermatitis	56	41,63	9,82

Psychosomatically ill patients with dermatological symptoms were collected through the following: private clinics of general dermatology and aesthetic dermatology, public dermatological clinics (National Health Fund), the Dermatological Unit in Dermatology and Venereology Clinic (Medical University), contact with fellow patients and their acquaintances, the Lower Silesia Association for Psoriasis.

Psychosomatically ill patients with symptoms in the area of the digestive system were collected/contacted through Internet forums, gastroenterological clinics in Wrocław, and hospital wards, including among others: the Gastroenterology and Hepatology Clinic at the Medical University in Wrocław, the Gastroenterological Ward in the J. Gromkowski Hospital in Wrocław.

The patients were qualified to be in the ward due to the recognition of the following illnesses: irritable bowel syndrome, psoriasis or atopic dermatitis, which had been diagnosed at least one year before the examination. As far as possible the recognition was objectified through access to the medical records and conversations with the attending doctors. In rare cases, information about the recognition of the condition was personally provided by the patients. The research has a psychological character, which is why the severity of the diseases was not rated. Instead of this, the subjective feeling of illness among the patients participating in the research and the patients identification with the problem was evaluated. Not only patients with actual symptoms of the diseases were qualified to take part in the research, but also those who could expect a relapse due to the chronic nature of the disease. The Commission on the Ethics of Scientific Research at the Psychology Institute agreed to t this research being carried out.

Statistical analysis methods

Statistical analysis was conducted using the SPSS 21 and Statistics 6, 10: Descriptive statistics (numbers, average, standard deviation), multiple regression model, structural equation modelling – paths analysis.

Procedure

The people invited to take part in the research were familiar with the aim and the course of the study; then they gave their informed consent to participate in the study. The research had an individual character.

Results[10]

The study of the conditions of the sense of body boundaries among the psychosomatically ill patients started from establishing opportunities to predict the strength of the sense of body boundaries and its dimension intensity: barrier and permeability. Linear regression stepwise analysis was conducted [11].

In the case of patients suffering from **irritable bowel syndrome**, the variance of the strength of the **sense of body boundaries** is explained in 29,9% (adjusted R^2) by the variability of the following significant predictors: sensitivity to the violation of self- boundaries in the dimension of the social self and the need for cognitive closure in the dimension of order preference as well as predictability preference (chart 5). The sensitivity of self- boundaries in the dimension of the social self is the stronger predictor, while the predictability preference is the weakest, as evidenced by the β values (chart 6). Based on increased sensitivity to the violation of self -boundaries in the dimension of the social self, the decrease in the strength of the sense of body boundaries can be predicted. The

[10] The value of the β factors for the dimension: **permeability** should be interpreted in accordance with the principle of inverse (because of the reversed punctuation key). That means that due to the increase in the intensity of variables with a negative value of β factor, we can predict the increase of permeability intensity and also its decrease – based on β with a positive value. For the strength of the sense of body boundaries and the dimension of barrier, the interpretation of the value of β factors is standard.

[11] Firstly, the stand out observations that could have a negative impact on the results of the regression analysis were diagnosed and deleted. The stand out observations were recognised as those whose value of Mahalanobis distance, after introducing all of the predictors to the model, exceeded the critical level of 29,588. It is a critical value of chi^2 distribution for 10 degrees of freedom on the significance level $p \leq 0{,}001$. |Together, 10 explaining variables were entered; then the stepwise regression analysis method saved only those in which the β factor was crucial on the $p < 0{,}05$ level. In each of the following regression studies, there were the following variables: the intensity of proprioception, the style of cognitive functioning (independence from the field), the need for cognitive closure in the dimensions: preference of order, preference of predictability, intolerance of ambiguity, mental closeness, decisiveness; moreover, the sensitivity to the violation of the "I" boundaries in three dimensions: the bodily I, the social I and the symbolical I. It was decided not to include the results obtained in the range of concentration on the surface of the body as well as the age/life period, since as shown in Pearson's correlation analysis and tests of the significance of the differences, the variables do not considerably bind with the sense of body boundaries and its dimensions. Furthermore, the global results in the range of the need of cognitive closure and sensitivity to the "I" boundaries, were also not included, in order to reduce the phenomenon of the colinearity of predictors.

strength of the sense of body boundaries increases with the growth of the intensity of the need for cognitive closure in the dimension of order preference; whereas, it decreases in the dimension of permeability preference.

In the group of people suffering from **atopic dermatitis and psoriasis**, there are the following predictors of the strength of the **sense of body boundaries**: the style of cognitive functioning (independence from the field) and the dimensions of the need for cognitive closure: decisiveness and preference of predictability. Based on the increase of their values, the growth of the strength of the sense of body boundaries can be predicted. In this group, the predictors mentioned explain more than half of the variances of the overall score of the strength of the sense of body boundaries (chart 5). The predictors have been approached from the strongest to the weakest (chart 6).

Chart 5. The summary of the model of regression analysis for the strength of the sense of body boundaries in the groups marked out on the basis of their state of health. Irritable bowel syndrome N=56, psoriasis, atopic skin dermatitis N=56

	R	Adjusted R^2	Standard error of estimation	ANOVA			
				F	df1	df2	Significance F
Irritable bowel syndrome	0,581	0,299	11,989	8,82	3	52	**0,000**
Psoriasis, atopic skin dermatitis	0,733	0,511	9,217	20,17	3	52	**0,000**

Predictors – irritable bowel syndrome: (Constant), the sensitivity to the violation of the boundaries of social self (social SnaG), the preference of order, the preference of predictability – the dimensions of the need of cognitive closure
Predictors – psoriasis, atopic skin dermatitis: (Constant), the style of cognitive functioning – independence from the field (GEFT), decisiveness, the preference of predictability – the dimensions of the need of cognitive closure

Chart 6. The standardised and non-standardised coefficients of the regression analysis for the strength of the sense of body boundaries in the groups marked out on the basis of their state of health . Irritable bowel syndrome (IBS) N=56, psoriasis, atopic skin dermatitis N=56

		Non-standardized coefficients		Standardized coefficients β	t	Significance
		B	Standard error			
Irritable bowel syndrome	(Constant)	74,594	12,016		6,208	**0,000**
	Social SnaG	−0,810	0,220	−0,421	−3,683	**0,001**
	Order preference	2,743	0,812	0,395	3,378	**0,001**
	Predictability preference	−1,947	0,718	−0,321	−2,710	**0,009**

		Non-standardized coefficients		Standardized coefficients β	t	Significance
		B	Standard error			
Psoriasis, atopic skin dermatitis	(Constant)	9,089	8,035		1,131	0,263
	GEFT	2,359	0,458	0,497	5,155	**0,000**
	Decisiveness	1,128	0,238	0,448	4,729	**0,000**
	Predictability preference	1,749	0,517	0,325	3,381	**0,001**

Denotations: decisiveness, order preference, predictability preference – the dimensions of the need of cognitive closure. GEFT – the style of cognitive functioning (independence from the field), social SNaG – the sensitivity to the violation of the boundaries of social self

In the group of people suffering from **irritable bowel syndrome**, the sense of **barrier** predictors are the dimensions of the need for cognitive closure: predictability and order preference. Together, they explain 21,8% of the variability of the barrier results (chart 7). The predictability preference is a stronger predictor than the order preference (chart 8). Moreover, the intensity of the barrier dimension decreases with the increase in predictability preference; however, it increases when there is growth in the intensity of the order preference.

Taking into consideration the people suffering from the **atopic skin dermatitis and psoriasis**, the following predictors are crucial: the need for cognitive closure in the dimension of decisiveness and predictability preference, as well as the style of cognitive functioning (independence from the field). The increase in the value of these variables gives an opportunity to predict the growth of the intensity of the body boundaries barrier. These predictors explain about 40,1% of the variance of the barrier feeling (chart 7), wherein the strongest predictor is the need for cognitive closure in the decisiveness dimension, while the weakest is the style of cognitive functioning (chart 8).

Chart 7. The summary of the model of the regression analysis for the barrier dimension in the groups singled out on the basis of their state of health. Irritable bowel syndrome N=56, psoriasis, atopic skin dermatitis N=56

	R	Adjusted R^2	Standard error of estimation	ANOVA			
				F	df1	df2	Significance F
Irritable bowel syndrome	0,496	0,218	4,672	8,66	2	53	**0,001**
Psoriasis, atopic skin dermatitis	0,659	0,401	3,620	13,29	3	52	**0,000**

Predictors – irritable bowel syndrome: (Constant), predictability preference, order preference – the dimensions of the need of cognitive closure
Predictors – skin: (Constant), decisiveness, predictability preference – the dimensions of the need of cognitive closure, the style of cognitive functioning – independence from the field (GEFT)

Chart 8. The standardised and non-standardised coefficients of the regression analysis for the barrier dimension in the groups singled out on the basis of their state of health . Irritable bowel syndrome N=56, psoriasis, atopic skin dermatitis N=56

		Non-standardized coefficients		Standardized coefficients β	t	Significance
		B	Standard error			
Irritable bowel syndrome	(Constant)	25,875	4,059		6,375	**0,000**
	Predictability preference	−1,032	0,277	−0,461	−3,732	**0,000**
	Order preference	0,869	0,316	0,339	2,746	**0,008**
Psoriasis, Atopic skin dermatitis	(Constant)	5,640	3,155		1,788	0,080
	Decisiveness	0,906	0,180	0,538	5,039	**0,000**
	GEFT	0,194	0,094	0,217	2,071	**0,043**
	Predictability preference	0,748	0,203	0,392	3,681	**0,001**

Denotations: decisiveness, order preference, predictability preference – the dimensions of the need of cognitive closure. GEFT – the style of cognitive functioning (independence from the field), SNaG social – the sensitivity to the violation of the boundaries of social self.

Lastly, an attempt was made to make a prediction about the permeability dimension among the patients taking part in the research.

In the group of people suffering from **irritable bowel syndrome**, the percentage of explained variability of permeability dimension is 32,8% (chart 9). This variance is clarified by sensitivity to the violation of self- boundaries in the dimension of the social self (the stronger predictor) and the need of cognitive closure in the dimension of ordinance preference (chart 10). Based on the growth of the intensity of sensitivity to the violation of self-boundaries in the dimension of the social self, an increase in the intensity of permeability can be predicted. Moreover, based on the growth of the order preference, a decrease can be foreseen as well.

Considering the patients with **skin diseases**, the percentage of the explained variance of the permeability dimension is as high as 49,6% (chart 9). The crucial predictors in this group are the following (from the strongest to the weakest): the style of cognitive functioning (independence from the field), the need for cognitive closure in the dimensions: decisiveness as well as predictability preference and intensity of proprioception (chart 10). Depending on the increase in the intensity of proprioception, we can speculate that there will be growth in the intensity of permeability; then, based on the increase of the intensity of other variables – its decrease.

Chart 9. The summary of the model of the regression analysis for the permeability dimension in the groups marked out on the basis of their state of health . Irritable bowel syndrome (IBS) N=56, psoriasis, atopic skin dermatitis N=56

	R	Adjusted R^2	Standard error of estimation	ANOVA			
				F	df1	df2	Significance F
Irritable bowel syndrome	0,594	0,328	8,089	14,45	2	53	**0,000**
Psoriasis, Atopic skin dermatitis	0,730	0,496	6,971	14,53	4	51	**0,000**

Predictors – IBS: (Constant), the sensitivity to the violation of the boundaries of social self (social SNaG)., the preference of order – the dimension of the need of cognitive closure

Predictors – skin: (Constant), the style of cognitive functioning – independence from the field (GEFT), decisiveness, predictability preference – the dimensions of the need of cognitive closure, the intensity of proprioception (IP)

Chart 10. The standardised and non-standardised coefficients of the regression analysis of the dimension of permeability in the groups singled out on the basis of their state of health . Irritable bowel syndrome (IBS) N=56, psoriasis, atopic skin dermatitis N=56

		Non-standardized coefficients		Standardized coefficients β	t	Significance
		B	Standard error			
Irritable bowel syndrome	(Constant)	38,085	7,061		5,394	**0,000**
	social SNaG	−0,635	0,147	−0,479	−4,331	**0,000**
	Order preference	1,620	0,529	0,338	3,061	**0,003**
Psoriasis, Atopic skin dermatitis	(Constant)	15,813	8,067		1,960	0,055
	decisiveness	1,137	0,373	0,322	3,049	**0,004**
	GEFT	0,953	0,181	0,508	5,275	**0,000**
	Predictability preference	1,006	0,391	0,251	2,572	**0,013**
	IP	−0,124	0,053	−0,242	−2,335	**0,024**

Denotations: decisiveness, order preference – the dimensions of the need of cognitive closure, GEFT – the style of cognitive functioning (independence from the field),

social SNaG – the sensitivity to the violation of the boundaries of social self, IP- intensity of proprioception

The next stage of the studies endeavoured to establish the psychological factors that are significant in the genesis of the sense of body boundaries among the psychosomatically ill patients. An attempt was also made to specify in which aspects of body self- relation the role of the sense of body boundaries is the strongest (in the area of body self- relation the following aspects were analysed: evaluation and orientation towards physical attractiveness, evaluation and orientation towards physical fitness, evaluation and orientation

towards health as well as orientation towards illness; moreover, the comfort drawn from touch was taken into account). The following procedure was carried out for this purpose: the theoretical model of the conditions and aftermaths of the sense of body boundaries was tested by modelling the structural equations – through path analysis[12]. The model of the best matching indicators revealed the cause and effect variables for the strength of the sense of body boundaries.

The correlations between the sense of body boundaries as well as the variables defining its conditions and after-effects were taken into account in the selection of variables for particular models. The theoretical premises were recognised as the basis of the plan.

The path analysis in the sample of patients with irritable bowel syndrome

The function discrepancies method GLS→ML was applied, without the assumed standardisation while adding the obtained correlations between the variables to the analysis.

The model that was obtained fitted well with the data: $chi^2(15) = 20{,}91$; $p = 0{,}140$.

Considering the patients suffering from irritable bowel syndrome, the model which fitted best to the data (diagram 1) is the one according to which the strength of the sense of body boundaries is conditioned by sensitivity to the violation of self- boundaries in the social dimension and order preference (the dimension of the need for cognitive closure). In accordance with the resulting model, the aftermaths of the sense of body boundaries among the patients with irritable bowel syndrome are revealed in such areas of body self- relation as: evaluation of attractiveness as well as evaluation of health and comfort in touch, similar to the healthy people. Furthermore, the chosen model indicates that among the patients with IBS, the after-effect of the sense of body boundaries is the evaluation of physical condition.

[12] The research was conducted on the groups identical with the previous ones in terms of numbers. Due to the lack of the data (which were so far replaced with the average values), some of the cases were substituted with the results of the new members (5 cases in the skin illnesses and 6 cases in the irritable bowel syndrome diseases).

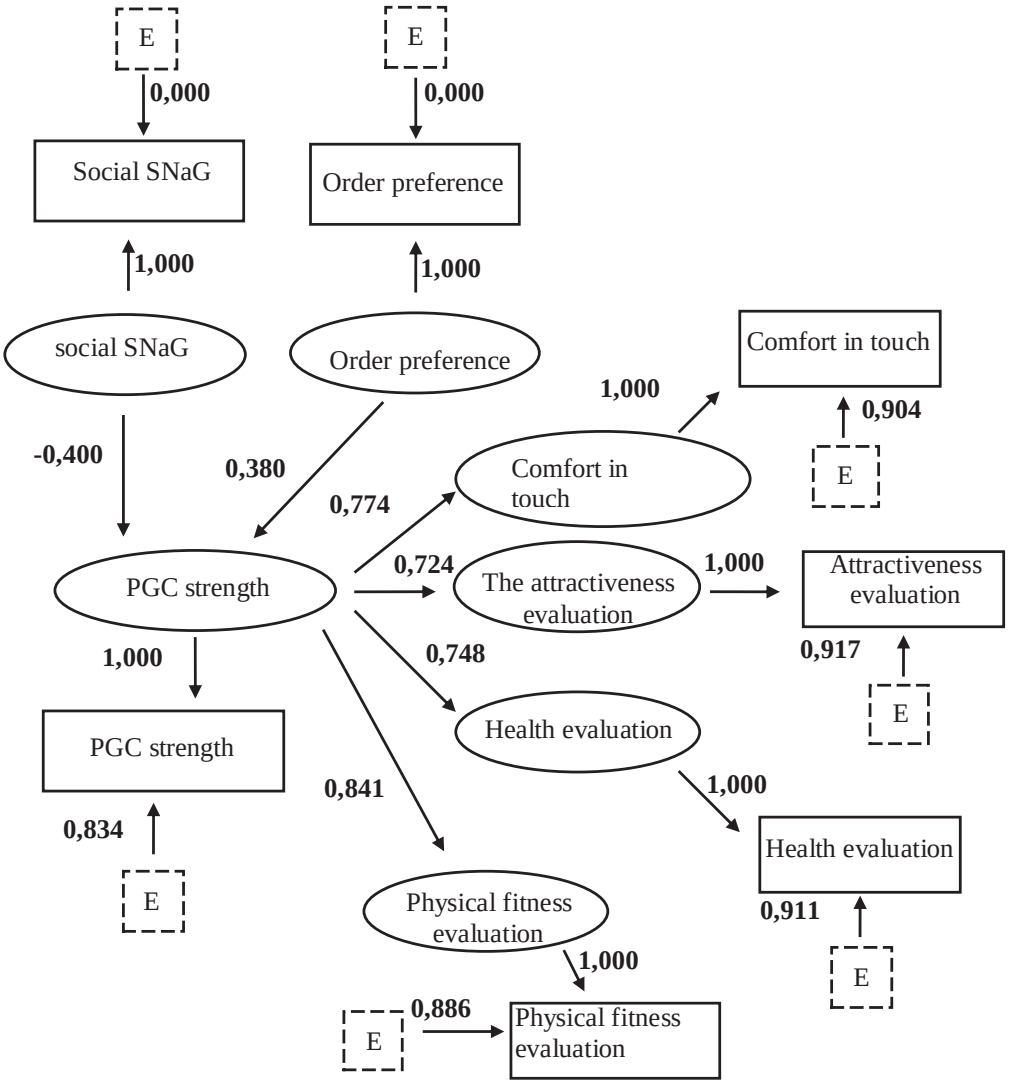

Diagram 1. The results of the path analysis for the model of the conditions and after-effects of the strength of the sense of body boundaries among the people suffering from the irritable bowel syndrome, N=56. In the rectangular brackets the open variables are shown; in the circular brackets, the hidden variables are shown; E means the residual variables that are shown in the frame with the dotted line. The negligible statistical relations are deleted from the model. The strength of PGC – the strength of the sense of body boundaries. Social SNaG – sensitivity to the violation of the self -boundaries in the dimension of the social self.

The path analysis among the patients with psoriasis and atopic dermatitis

The function discrepancy method GLS was applied, without assumed standardisation while adding to the analysis the correlations obtained between the variables.

The model presented below fitted well with the data: $chi^2(1) = 0{,}10$; $p = 0{,}756$.

The model which is presented (diagram 2) indicates that among the people suffering from psoriasis and atopic dermatitis, the strength of the sense of body boundaries is conditioned by the level of the need for cognitive closure in the decisiveness dimension. The important after-effect of the sense of body boundaries among those examined who had skin diseases is revealed to be the level of health orientation.

Discussion

This thesis has sought to recognise the conditions affecting the sense of body boundaries and their after-effects for body self- relation among the psychosomatically ill patients.

In the light of reports in the literature, people with symptoms of psychosomatic illness on the skin reveal a stronger sense of body boundaries than people with symptoms in the area of the digestive system, which was associated with personality differences[13] (Fisher, Cleveland, 1956, 1958; Fisher, 1963). In our own research (Krzewska, 2015), conducted earlier on a group of healthy and ill people (the same ones whose results are described in the following thesis), contrary to reports in the literature, there were not any significant intergroup differences in terms of the strength of the sense of body boundaries and its dimensions. The healthy individuals did not differ from either of the particular groups of ill people with regard to the strength of their sense of body boundaries and its dimensions. Additionally, the individuals with IBS did not differ in this regard from the individuals with psoriasis and atopic dermatitis. This leads to the following question: what are the factors that determine the strength of the sense of body boundaries and its dimensions in each particular group: the healthy subjects and the two groups of ill subjects.[14]

[13] Activity, volition and assertiveness vs, passivity and dependency.

[14] When in the first phase of the project the model of conditions and aftermaths of the sense of body boundaries among healthy people was tested (Krzewska, Dolińska Zygmunt, 2016), the path analysis showed that the strength of the sense of body boundaries depends on the style of cognitive functioning (independence from the field) and decisiveness – as the dimension of the need of cognitive closure. This model indicated that the sense of body boundaries among the healthy is conditioned by their comfort in touch, their evaluation of attractiveness and health evaluation. The conducted regression analysis, which was carried out at the same time, also revealed that among the healthy people the style of cognitive functioning and decisiveness as a dimension of the need of cognitive closure definitely explain the small range of variability of the strength of the sense of body boundaries and its dimensions. That is indicated based on the omission of the significant variables explained in the accepted theoretical model of the conditions and the aftermaths of the strength of the sense of body boundaries. In spite of the low percentage of explained variance, the collected results suggested that among healthy

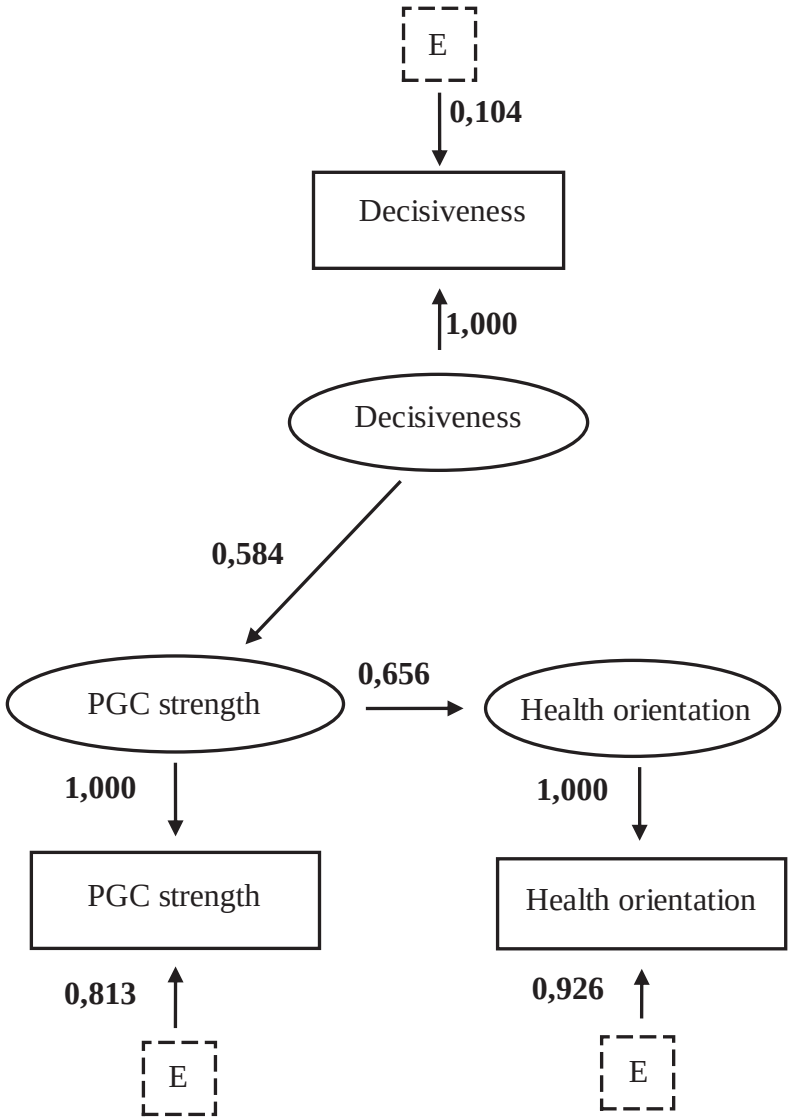

Diagram 2. The results of the path analysis for the model of the conditions and after-effects of the strength of the sense of body boundaries among the people suffering from psoriasis and atopic skin dermatitis, N=56. In the rectangular brackets, the open variables are shown; in the circular brackets the hidden variables are shown; E means the residual variables that are shown in the frame with the dotted line. The negligible statistical relations are deleted from the model. The strength of PGC – the strength of the sense of body boundaries.

The testing of the model of the conditions and the aftermaths of the sense of body boundaries among the people with irritable bowel syndrome indicated that the following factors affect the sense of body boundaries: sensitivity to the violation of self- boundaries in the dimension of the social self and order preference (the dimension of the need for cognitive closure). This result suggests that the issue of the sense of body boundaries among the patients with IBS can be manifested in their sense of social identity and in the matter of social functioning. Various interpretations are suggested by the influence of order preference (as a dimension of the need for cognitive closure) on the sense of body boundaries in this group. Perhaps this can be understood in two ways: firstly, as organising the experience of the disease according to rules that are beneficial for mental well-being and secondly, as attempting to compensate for the withdrawal from social relations. The studies by Endo and others (2011) indicate that lower self - efficacy is observed among people with IBS than those in the control group, which explains the direction of the interpretation. As shown in the unpublished studies by Krzewska and Ruda (2013), the strength of the sense of body boundaries remains in a positive relation with the sense of self - efficacy among young healthy people. These dependencies create interesting scope for further research and interpretations.

The path analysis among the patients with psoriasis and atopic dermatitis indicated that variable decisiveness (the need of cognitive closure dimension) is the main factor influencing the strength of the sense of body boundaries. This result suggests that decisiveness may be manifested by the way the people with the listed skin diseases experience their own bodies. This is another premise for the dependence of the sense of body boundaries on cognitive-motivational variables, instead of those strictly bound with the body. The result which was obtained indicates that psychological variables have a significant role in the sense of body boundaries (Krzewska, Dolińska-Zygmunt, 2016) not only among healthy people, but also among the ill people suffering from psoriasis and atopic dermatitis.

The outcome, which is difficult to interpret clearly, is the diversity of the determinants influencing the sense of body boundaries among the people with the previously mentioned skin and bowel diseases. The social factor should play an important role in the sense of body boundaries in both cases; nevertheless, it does not work in this way. This result opens a field of entertaining research and interpretations.

The results of the multiple regression analysis, conducted to reveal predictors of the strength of the sense of body boundaries and its dimensions, confirmed and completed the results of the path analysis. Considering the patients with IBS, the possibility to draw

people, the sense of the body boundaries is a phenomenon related not only to physical experience (like, e.g. perception of body signals) but also conditioned by a broader cognitive, emotional and motivational context. These results encouraged the formulation of questions about the character of the conditioning of the strength of the sense of body boundaries among psychosomatically ill patients.

conclusions about the strength of the sense of body boundaries and the sense of permeability of the boundaries was confirmed, especially based on their sensitivity to the violation of self- boundaries in the dimension of the social self.[15] The outcome indicates the significant importance of the loss of the sense of security in the social aspect for the sense of body boundaries and the sense of boundaries' permeability among the patients suffering from IBS. The higher this sensitivity is, the lower the strength of the sense of body boundaries is and, at the same time, the higher the sense of susceptibility to violation (permeability) is. This dependency can be justified by the character of the symptoms experienced by the unhealthy people: in case of diarrhoea, the patients complain about their constant anxiety over the uncontrollable symptoms and the huge feeling of helplessness accompanying it. It significantly reduces the comfort of social functioning and tends to lead to the experience of anxiety in social relationships; moreover, it frequently ends with avoidance of participation in social life (Hulisz, 2004).

The result, which is coherent with the one previously described, is the possibility of predicting the strength of the sense of body boundaries among people suffering from IBS, based on the order preference and on the permeability preference, both as dimensions of the need for cognitive closure. This dependence manifests itself in the following way: the increase in the order preference leads to an increase in the strength of the sense of body boundaries; whereas, the increase of permeability preference leads to a decrease in the strength of the sense of body boundaries. This causes some interpretation difficulties, because it seems to be self-contradictory. The need for permeability can often be referred to the predictability of situational factors (frequently random); while the need for order can be referred to the phenomenon of the will and controllable things, such as the factors targeted on the creation and maintenance of order. It can be supposed that the lower preference of predictability means that the unhealthy person copes with the symptoms (which are predictable for her/him) better, so the strength of his/her sense of body boundaries is bigger (Fisher, 1963). On the other hand, the preference of order can be a variable of personality, which helps an individual to cope with the disease.

The need of predictability (the dimension of the need of cognitive closure) among the people with IBS can for example be largely related to the risk of the necessity of suddenly going to the toilet. People with diarrhoea or a mixed form of IBS try to organise their day in a predictable manner; they do not like sudden situations, since they can be connected with a reduced sense of security in the body area. The possibility of predicting the strength of the sense of body boundaries based on the need of predictability can

[15] This pattern is characterised especially by women (Krzewska, 2015) and is coherent with the crucial advantage of women among the examined patients who were examined. Its presence leads to asking the following questions: if the same predictors of the sense of body boundaries would characterise a male group of patients with IBS?

probably be explained by the level of effectiveness in coping with the disease. The level of coping with other situational factors seems to be crucial. The lower the experience of the predictability of the situation, the stronger the sense of the body boundaries, as well as the lower the sense of the permeability of the boundaries. It is possible that these people are capable of predicting a situation, such as the symptoms of an illness and the possibility of coping with them in a predictable, safe and unequivocal manner.

Interestingly, the result is consistent with that observed among healthy people (not recognised as suffering from a psychosomatic illness, correlation model) (Krzewska, 2015). The increase in the strength of the sense of body boundaries together with the decrease in the intensity of the boundaries' permeability cause the diminishing of the need of permeability and the intolerance of ambiguity (the dimensions of the need of social closure) among healthy people. This suggests that health (and coping with an illness) can be identified with the ability to maintain one's own physical identity independently from changing environmental conditions. That can probably be linked with the ability to maintain internally referenced standards in spite of the instability of the situation (e.g. travelling on a bus without toilets can be negatively experienced by people with IBS as a more or less predictable situation). As it is known, the stronger the sense of body boundaries is, probably the bigger the personal resources are in coping with stress and processing data about the situation in accordance with internal standards (Jakubik, 2003; Witkin, 1968, Strealu, 2002, Fisher, Cleveland, 1958, Fisher, 1963, Fisher, 1970).[16] Additionally, it is worth recalling the result of the studies (Krzewska, 2015), according to which, among healthy people, a weak correlation is observed between the strength of the sense of body boundaries together with the sense of permeability and sensitivity to the violation of the self- boundary in the dimension of the symbolic-territorial self . Moreover, a correlation is noticed between the sense of permeability of boundaries and sensitivity to the violation of self- boundaries in the dimension of the social self . The last convergence assimilates the people with irritable bowel syndrome to the healthy ones; therefore the correlation is moderate in nature. This suggests that the patients with IBS have a severe representation of some instructions that are crucial for the sense of body boundaries. These instructions seem to be less important for healthy people.

The possibility of predicting the increase in the strength of the sense of body boundaries and the decrease in the sense of permeability of body boundaries based on increasing order preference (the dimension of the need of cognitive closure) is the characteristic and the distinction of people with irritable bowel syndrome in comparison to healthy people

[16] It seems to be probable that the strength of the sense of body boundaries among the IBS patients may be bound with the objective characteristics of the situation itself (e.g. little intensity of the symptoms of the disease for years) and also with the individual predispositions (the perception of the world and incoming information according to the safe and well-known scheme). (I.K.)

(Krzewska, Dolińska-Zygmunt, 2016) and those with skin diseases. The result is appealing in the light of reports concerning a higher intolerance of uncertainty among people with a stronger order preference (Kossowska, 2003). Uncertainty about the time and place when symptoms may occur seems to be a distinctive sign of irritable bowel syndrome. A stronger order preference should be associated with worse tolerance of uncertainty connected with the symptoms of less effective coping with illness and hence, a less strong sense of body boundaries, which is frequently considered in relation to the health potentials (Krzewska, Dolińska-Zygmunt, 2012; Krzewska, Ruda, Rymaszewska, 2012).[17]

Both sensitivity to the violation of self -boundaries in the dimension of social self as well as the need for cognitive closure in the dimensions of order preference and predictability, together explain about 30% of the variability of the strength of the sense of body boundaries among the people with IBS. In view of the psychological character of the factors causing an escalation in the symptoms of this syndrome, the meaning of the emerging predictors of the sense of body boundaries for the course of illness can be considered. In particular, an intriguing direction seems to be contemplation of the degree of need for control among IBS patients. They may experience a sense of disruption of physical identity, when they feel the impossibility of predicting (controlling?) a situation; what is more, they may feel reinforced symptoms under the influence of stress. Because of the fact that patients suffering from irritable bowel syndrome have a sense of the ineffectiveness of the treatment they receive, more often than with other diseases (Orzechowska and others 2013), it is worth studying personal factors in their assessment of the situation. It is worth mentioning that the results of the research do not show a lower sense of body boundaries among the patients with IBS in relation to the healthy people and those who are ill ; they do not indicate weaker predispositions in the scope of coping with the illness (also in the studies by Krzewska (2012), the IBS patients did not differ from the healthy ones in the area of the strength of the sense of body boundaries). The results display only the need for predictability (as a dimension of the need for cognitive closure) as a significant predictor of the strength of the sense of body boundaries in this group of the ill people .

The predictors that are essential for the sense of body boundaries in the case of irritable bowel syndrome (sensitivity to the violation of the boundary of the social self; the need of order and predictability) should be considered in relation to data on violence and sexual abuse;

[17] As already stated, the possibility of prediction of the increase of the strength of the sense of body boundaries and the decrease of the sense of permeability on the basis of the stronger need of order among the people with the irritable bowel syndrome can be related with their active and controllable attempts to organize the world in order to cope with the symptoms better as well as to encourage the sense of the impact on these symptoms. One of the instances is the attempt to organize the day in such way to avoid being away from the toilet (e.g. going home directly after work) or the need of order in terms of diet – that promotes a feeling of taking control of the symptoms and potentially reduces the need of predictability in this area, in connection with the experienced own effectiveness.

therefore, situations connected with chaos, violence, or abuse, which are mentioned by some researchers as crucial factors in IBS disclosure among some people (Nauert, 2011).

There is an impression that the sense of body boundaries can be conditioned by factors that are crucial for coping with an illness and experiencing oneself as a sick person; however, the nature of these factors remains dependent on health condition.

Among the people suffering from skin diseases, cognitive style (independence from the field) and the need for cognitive closure in the dimensions of decisiveness as well as predictability preference, explain about 50% of the variability of the strength of the sense of body boundaries – with an interpretatively interesting direction of dependence, according to which the increase in the need of predictability (the dimension of the need of cognitive closure), leads to the increase in the strength of the sense of body boundaries and the intensity of barrier, and the decrease in the sense of the boundaries' permeability. The result concerning the need of predictability is exactly opposite to the one obtained among the healthy people (here: in correlation analysis) (Krzewska, 2015) and the IBS patients (regression analysis): the sense of body boundaries among the people with skin diseases is stronger and higher than the need of predictability is. Among the people with irritable bowel syndrome with a strong sense of body boundaries, the hardly predictable symptoms of the disease can be less perceptible as an obstacle in everyday life; while, among the people with skin diseases with a stronger sense of body boundaries, and a higher need of predictability seems to be related to the need of influencing the symptoms of the skin disease – which can be controlled to a greater extent than the symptoms of IBS. These symptoms appear to have a character that is less surprising, less disrupting in social functioning and more stable in time than diarrhoea, which is difficult to control, and their predictability seems to be relatively higher than the symptoms of dysentery in IBS. The appearance in skin diseases can be regulated to a certain degree by means of clothing or make-up. Someone can also cope with it, for example, through appropriate management of the frequency of social contacts and places of residence. In the light of reports in the literature (Fisher, 1963), lower resistance to stress and the potentially increased need of predictability which is connected with it (the dimension of the need for cognitive closure) should be rather consistent with the weaker sense of body boundaries – which was connected with lower abilities of coping with stress. It is possible that higher stress levels among patients with skin diseases (Korabel, Dudek, Jaworek, Wojas-Pelc, 2008) promote the need of predictability, which can be associated with greater effectiveness and its realisation; and this connects with the stronger sense of body boundaries. In the research by Krzewska (2012), the people suffering from psoriasis and atopic dermatitis revealed a weaker sense of body boundaries than healthy people. Possibly, the preference for predictability can be interpreted in the group currently being investigated according to the implications that are

caused by a strong sense of body boundaries: such as the lack of an attitude of resignation, which is helpful in coping with stress and the symptoms of the disease.

The predictors of the strength of the sense of body boundaries among the patients with skin diseases assimilates this group to the group of healthy people (the need of cognitive closure in the dimension: decisiveness, cognitive style – independence from the field) (Krzewska, Dolińska-Zygmunt, 2016). Nevertheless, there are indications of participation which is five times higher in the explained variance than in the group of healthy people. Perhaps among people with skin diseases, being exposed to stress connected with the unsettled dimension of their own aesthetic as well as with the suffering connected with the pain and the duration of the illness is associated with an increase in the importance of such individual dispositions which foster a sense of physical separateness from the surroundings and the integrity of one's own body (barrier and permeability) – therefore coping better with the disease. Decisiveness as the dimension of the need of cognitive closure undoubtedly favours the sense of control; whereas, the ability to process information selectively in accordance with internal standards (independence from the field) can be significant for the maintenance of one's own identity and the efficient regulation of social contacts.

As far as the barrier predictors are concerned, in the group of people with skin diseases, decisiveness plays a special role (the dimension of the need for cognitive closure). The explained variance of 40%, among the people suffering from psoriasis and atopic dermatitis is additionally illustrated by their style of cognitive functioning (independence from the field) and their preference for predictability (the dimension of the need for cognitive closure). The fact that in the studies, among the healthy people these variables gain only marginal importance for the sense of body boundaries (Krzewska, Dolińska-Zygmunt, 2016) is probably related to the increased diversity of the examined sample and the existence of numerous additional factors that may have an influence on the sense of body boundaries in this group. In one of the studies, the people with skin diseases revealed higher indicators of separateness from the environment (barrier) than the ones with IBS, which can doubtlessly be linked with the occurrence of the symptoms on the surface of the skin and its greater presence in the subject's awareness (Krzewska, 2012). Conceivably, among people who are developing skin diseases, the sense of one's own separateness from the environment is conditioned by psychical instructions whose intensity exceed the beneficial levels for coping with stress, resulting in the symptoms of the disease. In another interpretation, such psychical instructions may be a characteristic adaptation of the illness's symptoms for people with skin diseases. It should also be noted that people with skin diseases show a correlation between the strength of the sense of body boundaries in both its dimensions and a global need for cognitive closure (Krzewska, 2015). It suggests the harmony of cognitive motivations for the maintenance of the sense of physical

identity in this group – that can signal the existence of a significant mechanism for coping with the illness. Additionally, the role of sensitivity to the violation of self -boundaries in the dimension of the symbolic-territorial self with regard to the sense of body boundaries and separateness from the environment (barrier) can be observed among patients with skin diseases (Krzewska, 2015), which indicates the spatial and material dimension of the factors that are meaningful to the sense of body boundaries in this group of ill people. In comparison with the people with IBS, whose symptoms are not visible to the environment, people with skin diseases struggle with the constant visibility of their symptoms – therefore the territorial aspect seems to be crucial for them.

Among the patients suffering from IBS, about 20% of variance, the sense of body boundaries is explained by the need for cognitive closure in the following dimensions: the preference of predictability and order, so by the factors that are also significant for the global strength of the sense of body boundaries of these people. Previous research by Krzewska (2012), which is different in comparison to the results described in the following thesis, pointed to the sense of barrier of body boundaries among the IBS patients compared to the healthy ones and the ones with skin diseases; moreover, it also pointed to a relatively higher involvement in external appearance in this group. It can be assumed that the sense of separateness from the environment (barrier) among people who are concentrated on the inside of their body (intestines) is the dimension that has a crucial compensatory meaning for the internal character of the symptoms and their importance for comfort in social relations. If we also take into account the sense of the permeability of body boundaries for the people with IBS, we can predict - mostly based on their sensitivity to the violation of self- boundaries in the dimension of the social self - that the compensatory meaning of the barrier dimension for feeling comfortable in one's own body gains importance.

Among the patients suffering from skin diseases, the sense of the susceptibility of the body's surface to violation (permeability) can be predicted at a level as high as 50% , on the basis of the same variables, which explain the global strength of the sense of body boundaries for these people: independence from the field (cognitive style) and decisiveness as well as predictability preference – as the dimensions of the need of cognitive closure. This can mean that the occurrence of symptoms on the surface of the skin is connected with the increased sense of physical sensitivity to violation; so, it is connected with a more physical character of the global strength of the sense of body boundaries than is observed among the IBS patients (among the latter, the relational and emotional character of the sense of body boundaries is marked and its predictors are the followings: sensitivity to the violation of self-boundaries in the dimension of the social self and the need for cognitive closure in the dimension of order preference). The following interpretation correlates with the observation

that the sense of the permeability of body boundaries among the skin disease patients can be predicted based on the intensity of proprioception; this kind of relation is not observed among healthy people (Krzewska, Dolińska-Zygmunt, 2016) or the ones with IBS (Krzewska, 2015). The higher the availability of the experiences from the body surface is, the stronger the sense of permeability of the boundaries among the people suffering from skin diseases is – and the nature of this dependence emerges as the opposite of what was expected (it was believed that an increase in insensitivity to proprioception leads to an increase in the sense of barrier and a decrease in the sense of the permeability of body boundaries). Among the people with skin diseases, this result seems to be understandable in view of the fact that the symptoms concerning the body surface can promote a general sense of their own susceptibility to violation in the body.

As shown by the results of these studies obtained from the group of psychosomatically ill patients – with IBS, psoriasis and atopic dermatitis (regression analysis and path analysis) in comparison with the results from healthy people (Krzewska, 2015, Krzewska, Dolińska-Zygmunt, 2016), the possibility of predicting (the range of variation) the strength of the sense of body boundaries and its dimensions as well as its genesis, are conditioned by various psychological factors, depending on health condition and the symptoms of the disease. The evaluation of the results of the research conducted among the group of psychosomatically ill people and healthy people (Krzewska, 2015, Krzewska, Dolińska-Zygmunt, 2016) also indicates some similarities in terms of the possibility of prediction and the understanding of the genesis of the sense of body boundaries in these groups.

The variety of determinants of the strength of the sense of body boundaries in the groups differ according to the symptoms of the psychosomatic disease (and, as it seems, health condition in general, Krzewska, 2015) and this shows that the sense of body boundaries can represent a slightly different psychological phenomenon, independently from its similar numerical values in the test studies. This interpretation opens the door to further research.

The test results which were collected (the regression and path analysis) indicate the polietiology of the sense of body boundaries among the psychosomatically ill patients and the high diversity in the range of importance that its particular conditions represent for the understanding of health and illness. The significance of the sense of body boundaries for coping with the illness seems to remain dependant on the nature of the symptoms being experienced and the manner of coping with them.

It is worth noticing that, similarly to the healthy people (Krzewska, 2015), the psychosomatically ill patients had results that speak for the sense of body boundaries as a phenomenon that is constituted by variables whose nature goes beyond the psychological experience of the body. It concerns the range of variables with a motivational-cognitive

character (especially among the patients with psoriasis and atopic dermatitis) as well as with elements of self conception (people with IBS). [18]

The research into the after-effects of the sense of body boundaries among the psychosomatically ill patients was again taken using the path analysis. Its results were in the area of the relation of a person with his or her own body, so a relation that is significant to the health condition.

The sense of body boundaries emerged as having a crucial influence on the evaluation of health and physical attractiveness, as well as the level of comfort in touch among the people suffering from IBS. It was corresponding among the healthy people (Krzewska, Dolińska-Zygmunt, 2016)– indicating the similarity of these groups in the range of the consequence of the way body boundaries are experienced. The greater the strength of the sense of body boundaries, the more positive the subject evaluates his or her own attractiveness, health condition and feeling in situations connected with touch. This result is the premise of the recognition of the universal influence of the sense of body boundaries on relations with one's own body and the level of comfort drawn from touch –variables of significant importance to health condition and its assessment. This influence is even more positive when the strength of the sense of body boundaries increases. The deviation from this pattern among the patients with skin diseases can be the exception that proves the rule (as described later).

The path analysis also demonstrated that, among the IBS patients, there is a significant impact of the sense of body boundaries on their evaluation of physical fitness – the more positive this influence is, the greater the strength of the sense of body boundaries is. This result distinguishes this group of the ill people in the other groups that were examined; moreover, it creates an interesting possibility for interpretation in the light of reports of the relatively less active and "volitional" attitude to reality among psychosomatically ill patients with symptoms inside the body (Fisher, Cleveland, 1956). Symptoms concerning the intestines can favour this kind of orientation. As our own studies show, experiencing gastrointestinal symptoms not only excludes the benefits that can be gained from the strength of the sense of body boundaries in the area of self-assessment of the physical condition (positive influence), but also even determines this state of affairs. This conclusion tends to reflect the fact that the objective symptoms probably do not always correspond with the cognitive and emotional involvement with the areas of the body that are related to them[19].

[18] It should be mentioned that the concentration of attention on the body surface proved to be a negligible predictor of the strength of the sense of body boundaries, which indicates the incorporeal nature of the psychological factors in the genesis of the phenomenon being examined.

[19] During the research connected with the construction of The Sense of Body Boundaries Questionnaire, the people who took part frequently declared the concentration of their attention on entirely different body parts

As far as the patients suffering from psoriasis and atopic dermatitis are concerned, the sense of body boundaries was revealed as having a crucial influence on the level of orientation on health: active engagement in maintaining or improving the health condition. The strong sense of body boundaries influences the psoriasis patients to make an effort to maintain or improve their health. These results confirm the hypothesis concerning the crucial role that the sense of body boundaries has on shaping the health condition of each person. Additionally, they are consistent with the assumption that the people who are focused on the body surface demonstrate a task orientation that is focused on actively changing their situation (Fisher, Cleveland, 1956). In this case, the patients who are potentially most focused on the skin (from all the examined groups), turn out to be actively focused on health; despite the lack of stronger indicators of the sense of body boundaries in comparison to other groups[20]. The people with skin diseases achieve probably the best results regarding their commitment to health as determined by the strength of the sense of body boundaries; because the skin symptoms seem to be a more objective obstacle in the positive evaluation of appearance, health condition and comfort in touch. It should be mentioned that the sense of body boundaries among this group of people did not influence such areas of body self- relation as the evaluation of attractiveness, health and comfort in touch; this can be explained by the nature of the symptoms.

The influence of the sense of body boundaries with relation to the evaluation of attractiveness, health and comfort in touch appears to be modified by the nature of the symptoms of the psychosomatic illness; furthermore, it seems to be exposed in those areas of coping with the illness with the highest importance for the sense of health.

The determinants and after-effects of the sense of body boundaries among the psychosomatically ill people with psoriasis and atopic dermatitis as well as with IBS, partly assimilate these groups with the healthy groups . It also emerged that the pattern of the conditions of the sense of body boundaries in both groups can be modified by the symptoms of the psychosomatic illness; furthermore, it can be connected with the means of coping with the illness. Additionally, the psychosomatic illness seems to constitute the background for the specific influence of the sense of body boundaries on the patient's relation with his or her own body. The knowledge of these dependences can contribute to a bet-

than seemed to be implied from the symptoms of the illness which they were suffering from (Krzewska, Dolińska-Zygmunt 2013). For instance, a person suffering from a chronic kidney disease mentioned only the external parts of the body which were devoted most of the attention in the context of taking care of beauty. It is not known if these answers were only declarative in nature or were compatible with the actual attitude of the respondents, e.g. with a compensatory nature in the face of common symptoms.

[20] The lack of differences in the field of the concentration of attention on the body surface (not only in the range of the sense of body boundaries) among people with differing health condition and disease symptoms (the skin vs. the digestive system) is a surprising result. Achieving this result opens up numerous questions, among others, whether the declared conscious concentration of attention on the particular body parts actually coincides with their everyday representation in the subject's awareness.

ter understanding of the psychological needs of people with psychosomatic illnesses (irritable intestines and the skin diseases described above); what is more, it can lead to the recognition of the functions of the body boundaries in a particular illness and the mechanisms for coping with it.

Our previous research (Krzewska, 2015) did not confirm the differentiating importance of the sense of body boundaries for the health condition of the patients we examined; however, they indicated appealing differences in the range of opportunities for predicting the strength of the sense of body boundaries and its dimensions among people who varied because of their health condition. This allows the extraction of significant therapeutic problems among the people with particular diseases, and hence, the possibility of indicating the areas of practical use of the results obtained . It is worth remembering that, among the IBS patients, emotional-social factors have a greater role in the aetiology of the sense of body boundaries; whereas, among the patients with skin diseases, physical and cognitive factors are more important. This is an interesting premise for the understanding of the factors that potentially aggravate the disease and, moreover, are areas of therapeutic effects. One of the examples of these kind of effects can be the strengthening of resolute attitudes (the dimension of the need of cognitive closure) among patients with skin diseases – this can encourage them to cope with the illness according to the results which were obtained. For the IBS patients, the crucial factor in easing the symptoms was the strengthening of their own sense of security in the area of social relations (e.g. through exercising interpersonal competence, such as assertiveness) as well as the strengthening of their own sense of perpetration through sport. The significance of these variables for the sense of body boundaries among patients with IBS may be an important indication for the understanding of the psychological issues connected with this disease.

The sense of body boundaries, according to the literature (Krueger, 2002ab; Mirucka 2003ab; Kowalik, 2003; Sakson-Obada, 2009; Sakson-Obada and Mirucka, 2013), appears to be an instance of the body self regulating body-self relation in the areas of health and disease. Irrespective of which aspects of the body relations gain from an increase in the sense of body boundaries, this influence seems to be mostly positive.

Bibliography

Bednarek, H. i Truszczyński, O. (2010). Analiza cech i struktury temperamentu pilotów preferujących zależny i niezależny od pola styl poznawczy. [Analysis of temperament characteristics and structure in pilots preferring dependant and independent cognitive style]. *Polski Przegląd Medycyny Lotniczej 16, 1,* 9-15.

Burris, C. T. i Rempel, J. K. (2004). It's the end of the world as we know it? Threat and the spatial symbolic self. *Journal of Personality and Social Psychology , 86, 1,* 19-42.

Cash, T. F. (2000). *The Multidimensional Body-Self Relations Questionnaire Users' Manual* (Wyd. 3). Available from the Author at www.body-images.com.

Cleveland, S. (1960). Body image changes associated with personality reorganization. *Journal of Consulting Psychology*, *3*, 256-26.

Cleveland, S.E. i Fisher, S. (1958). *Body Image and Personality*. Princeton: N. J., Van Nostrand.

Eigenbrode, C. R. i Shipman, W.G. (1960). The Body Image Barrier Concept. *The Journal of Abnormal and Social Psychology, 3*, 450-2.

Endo Y, Shoji T, Fukudo S, Machida T, Machida T, Noda S i Hongo M. (2011). The features of adolescent irritable bowel syndrome in Japan. *Journal of Gastroenterol Hepatology*, 3, 106-109.

Fisher, S. (1960). Head-body differentiations in body image and skin resistance level. *Journal of Abnormal and Social Psychology, 60, 2*, 283-5.

Fisher, S. (1963). A further appraisal of the body boundary concept. *Journal of Consulting Psychology, 1*, 62-74.

Fisher, S. (1970). *Body experience in fantasy and behavior*. New York: Appleton-Century-Crofts.

Fisher, S. (1971). Boundary effects of persistent inputs and messages. *Journal of Abnormal Psychology, tom 77, 3*, 290-95.

Fisher, S. i Cleveland S. E. (1956). Body image boundaries and style of life. *The Journal of Abnormal and Social Psychology,* 52, *3*, 373-79.

Fisher, S. i Fisher, R. (1964). Body image boundaries and patterns of body perception. *Journal of Abnormal and Social Psychology*, *68, 3*, 255-62.

Fisher, S. (1990). The evolution of psychological concepts about the body. W: T.F. Cash i T. Pruzinsky (red.), *Body image: development, deviance and change* (s.3-18). New York: Guilford Press.

Geiger, Á. (1978). The role of body-image boundary in the symptomatology of juvenile obesity. *Magyar Pszichológiai Szemle, 35,1,* 33-44.

Hirt, M .i Kurtz, R. (1969). A reexamination of the relationship between body boundary and site of disease. *Journal of Abnormal Psychology, 74, 1*, 67-70. Hulisz, D. (2004). The burden of illness of irritable bowel syndrome: current challenges and hope for the future. *Journal of Managed Care Pharmacy, 10, 4*, 299–309.

Hulisz, D. (2004). The burden of illness of irritable bowel syndrome: current challenges and hope for the future. *Journal of Managed Care Pharmacy, 10, 4*, 299–309.

Jakubik, A. (2003). *Zaburzenia osobowości [Personality disorders]* (wyd.3). Warszawa: Wydawnictwo Lekarskie PZWL.

Jaśkiewicz, M.i Drat-Ruszczak, K. (2011). Skala Wrażliwości na Naruszenie Granic Ja (SNaG): polska adaptacja Skali Amebowego Ja (Amoebic Self Scale) C. Burrisa i J. Rempela. [Sensitivity to Violatin of the Self-Boundaries Scale: polish adaptation of Amoebic Self Scale by Burris and Rempel]. *Psychologia Społeczna, 6, 3*, 252-66.

Korabel, H., Dudek, D., Jaworek, A. i Wojas-Pelc, A. (2008). Psychodermatologia: psychologiczne i psychiatryczne aspekty w dermatologii. [Psychodermatology: psychological and psychiatric aspects in dermatology]. *Przegląd Lekarski, 65, 5*, 244-8.

Kossowska, M. (2003). Różnice indywidualne w potrzebie poznawczego domknięcia [Individual differences in need for cognitive closure]. *Przegląd Psychologiczny, 46,* 355–375.

Kossowska, M., Hanusz, K. i Trejtowicz, M. (2012). Skrócona wersja Skali Potrzeby Poznawczego Domknięcia: Dobór pozycji i walidacja skali [Short version of the Need for Closure Scale: Items selectiona and validation of the scale]. *Psychologia Społeczna, 9,* 89-99.

Kowalik, S. (2003). Ja cielesne - próba nowego spojrzenia. [Body self – an attempt of new recognition]. *Polskie Forum Psychologiczne, 1,2*, 5-35

Krueger, D. (1989). *Body self and psychological self. A developmental and clinical integration of disorders of the self*. New York: Brunner Mazel.

Krueger, D.F. (2002b). *Integrating Body Self and Psychological Self*: *Creating a New Story in Psychoanalysis and Psychotherapy*. New York: Taylor & Francis Group.

Krueger, D.W. (1990). Developmental and psychodynamic perspectives on body image change. W: T.F.Cash i Pruzinsky T. (red.), *Body image: development, deviance and change* (s.255-269). New York: Guilford Press.

Kruger, D.W. (2002a). Psychodynamic Perspectives on Body Image. W: T. Pruzinsky i T.F.Cash (red.), *Body Image. A handbook of Theory, Research and Clinical Practice* (s.30-37). The Guilford Press: New York.

Krzewska I. (2015) *Poczucie granic ciała – podmiotowe uwarunkowania i następstwa w obszarze zdrowia*. *[Sense of body boundaries – subjective determinants and implications in health area]*. Uniwersytet Wrocławski – niepublikowana praca doktorska.

Krzewska, Dolińska Zygmunt (2016). Poczucie granic ciała - podmiotowe uwarunkowania i następstwa dla relacji z ciałem. [Sense of body boundaries – subjective determinants and implications for body self relation]. *Czasopismo Psychologiczne* – praca przyjęta do druku.

Krzewska, I. (2012). Znaczenie poczucia granic ciała dla wybranych postaw wobec ciała w grupie pacjentów dermatologicznych: z łuszczycą i atopowym zapaleniem skóry. Doniesienia wstępne. [Sense of body boundaries and its role in some body attitudes in the group of dermatological patients: with psoriasis and atopic dermatitis. Preparatory report.]. *Dermatologia Kliniczna*, *14, 4*, 175-81.

Krzewska, I. i Dolińska-Zygmunt, G. (2012). Poczucie granic ciała i jego implikacje dla kondycji zdrowotnej człowieka. [Sense of body boundaries and its implications for human health condition]. *Czasopismo Psychologiczne*, 18, 2, 325-34.

Krzewska, I. i Dolińska-Zygmunt, G. (2013). Kwestionariusz Poczucia Granic Ciała. Konstrukcja i własności psychometryczne [Sense of Body Boundaries Survey - construction and psychometric values]. *Polish Journal of Applied Psychology, 11,3,* 93-110.

Krzewska, I., Ruda, K. i Rymaszewska, J. (2012). Cielesny kontekst potencjałów zdrowia w rehabilitacji psychoonkologicznej poprzez muzykę i ruch. Rozważania teoretyczne. [Corporal context of health potentials in psychooncological rehabilitation by music and movement]. *Fizjoterapia*, *20, 2,* 43-49.

Matczak, A. (2000). Style poznawcze. [Cognitive styles]. W: J. Strelau (red.), *Psychologia. Podręcznik akademicki,* tom. 2 (761-782). Gdańsk: Gdańskie Wydawnictwo Psychologiczne.

Mirucka, B. (2003a). Poszukiwanie znaczenia cielesności i ja cielesnego. [Searching for the meaning of corporeity and body self]. *Przegląd Psychologiczny, 2*, 209 -223.

Mirucka, B. (2003b). Ja cielesne fundamentem osobowości. [Body self as a basis for personality]. *Polskie Forum Psychologiczne, 8*, 30–40.

Mirucka, B.i Sakson-Obada, O. (2013). *Ja cielesne. Od normy do zaburzeń*. [Body self. From the norm to disorders]. Wydawnictwo: GWP.

Nauert, R. (2011). Psychological Trauma Tied to Irritable Bowel Syndrome. *Psych Central*. from http://psychcentral.com/news/2011/11/01/psychological-trauma-tied-to-irritable-bowel-syndrome/30933.html

Orbach, I. i Mikulincer, M. (1998). The Body Investment Scale: Construction and Validation of a Body Experience Scale. *Psychological Assessment, 10, 4,* 415-25.

Orzechowska, A, Talarowska, M, Zboralski, K, Florkowski, A i Gałecki, P. (2013). Subiektywna ocena objawów i efektów leczenia a natężenie stresu i poziomu lęku wśród pacjentów z wybranymi chorobami skóry i układu pokarmowego. [Subjective evaluation of symptoms and treatment effects and levels of stress and fear in patients with some skin and gastrological diseases]. *Psychiatria Polska, XLVII, 2,* 225–237.

Rohricht, F. i Priebe, S. (2001). Specific body image pathology in acute schizophrenia. *Psychiatry Research, 101*, 289-301.

Rohricht, F. i Priebe, S. (2002). Do cenesthesias and body image aberration characterize a subgroup in schizophrenia? *Acta Psychiatrica Scandinavica, 105*, 276-282.

Ruda, K., Krzewska, I., Rymaszewska, J. i Koczanowicz, L. (czerwiec, 2013). *Znaczenie obrazu ciała dla skuteczności terapii poprzez muzykę i ruch. [The meaning of body image for success of music and movement therapy].* Referat wygłoszony na: Międzynarodowe Dni Fizjoterapii 2013, Akademia Wychowania Fizycznego we Wrocławiu, Wrocław, Polska

Sakson-Obada, O. (2003) Związek poczucia ciała z autodestrukcją u osób borderline. [Body experience and its relationship to self destruction in borderline disorder]. *Polskie Forum Psychologiczne, 8, 1-2*, 50-68.

Sakson-Obada, O. (2007). Od realności ciała do rzeczywistości umysłu. Wpływ wczesnej stymulacji na funkcjonowanie cielesnego ego. [From actuality of the body to realisty of the mind. An impact of early stimulation on body self mechanisms].W: A. Słysz i Ł. Kaczmarek (red.), *Preferencje poznawcze, percepcja, myślenie* (s. 35-55). Poznań: Wydawnictwo Naukowe UAM.

Sakson-Obada, O. (2009). *Pamięć ciała. Ja cielesne w relacji przywiązania i w traumie.* [Body memory. Body self in attachment style and trauma.] Warszawa: Difin.

Shontz, F. (1969). Perceptual and cognitive aspects of body experience. New York: Academic Press.

Strelau, J. (2002). *Psychologia różnic indywidualnych. [Psychology of individual differences].* Warszawa: Scholar.

Witkin, H. A. (1968). Psychologiczne zróżnicowanie i formy patologii. [Psychological differentiation and forms of pathology]. *Przegląd Psychologiczny, 16*, 75-104.

Witkin, H.A., Oltman P.K., Raskin E., Karp S.A. (1971, 2002). *A Manual for the Embedded Figures Tests.* Palto Alto: Consulting Psychologist Press.

Wolak, K. (1989). Problematyka badań nad tożsamością własnej cielesności. [Issues of research on identity and corporeity]. *Przegląd Psychologiczny, 4*, 937 – 57.

Wycisk, J. (2004). *Okaleczanie ciała. Wybrane uwarunkowania psychologiczne*. *[Self mutilation. Psychological factors]* Poznań: Bogucki Wydawnictwo Naukowe.

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