

HOW DOES URBAN GREENERY INFLUENCE OUR PHYSICAL, SOCIAL AND PSYCHOLOGICAL WELL-BEING? THE EFFECTS OF CITY SQUARES WITH OR WITHOUT TREES ON WELL-BEING OF USERS

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Statements such as „being in nature” and „being in the landscape” release positive emotions in our brain. This effect and the reactions initiated by the experience of being in nature have been scientifically proven in the psychological, physical and social fields.¹ Given that modern life is predominantly urban, the creation of urban open spaces is of particular importance, allowing the positive effects described above to impact on the lives and activities of city dwellers. Having access to a variety of urban open spaces supports our well-being in many ways. The empirical study explained in this article explores issues around the perception of and the effects of different public open spaces.

LANDSCAPE SCENES VERSUS CITY SQUARES

Open spaces in cities are complex places which not only allow leisure activities but are also places of residence, work

and social encounters and are therefore partly responsible for increasing the quality of urban life. Schwartz and Rüdüsüli describe urban public open spaces firstly, as leisure and living space, secondly, as having a social function, and thirdly, as having a psychological-hygienic function.² The latter became a trendsetting research chapter, which was identified as a future oriented theme during the 6th³ European Public Health Conference.⁴

The Swiss research project, Paysage à votre santé (The landscape and your health) – a project supporting health and landscape - describes four aspects on which one’s surroundings has an effect. These are the physical, psychological and social health and, in particular, effects on the health of children and young people.⁵ Physical health stems from movement and from an environment in which accessibility and attractive design promote physical activity. Psychological health refers to the increased ability to concentrate, to an increase in

positive feelings, to the reduction of frustration, annoyance and stress and to a reduction in criminal activity. Nature achieves this with the presence of trees, meadows and fields. Social health is promoted by the opportunities that green open spaces offer for social contacts and encounters. Moreover, the collective experience of nature strengthens the community. The countryside serves to improve the cognitive, motor, social and emotional skills of children and young people and to exert a positive influence on their health in the long term.

Public parks in urban environment are consciously associated with the positive effects of the landscape and nature. The recreational function is described as its major task. „The primary role of public parks is the satisfaction of everyday, regular recreational needs. ... Inhabitants still need parks to provide the experience of nature, they enjoy the peace and calmness provided by the valuable, mature tree stands and the historical space structure.”⁶ Accordingly, the positive effects of public

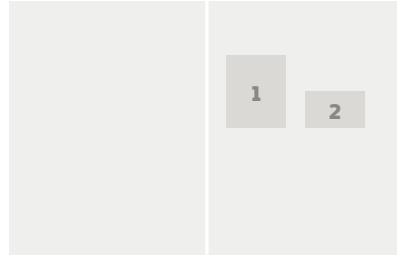


Figure 1-2:
A sequence from the
first slideshow
(images of landscape
scenes)



parks have been examined more often than the effects of other types of open space. This leads to new research questions, for example, regarding the possible effects of greenery on city squares. The view that inner-city urban green areas can compensate for the effects of mental and physical demands and can contribute optimally to regeneration is embedding itself into current city planning discussion and is increasingly being defined as an objective.⁷ The resolution, 'Values for the City of Tomorrow' describes the situation thus: „The aim of responsible city planning must be to equip townscapes with a distinctive identity, to improve fundamentally the urban green spaces in the centers and to increase the opportunities for leisure activities in the residential environment“.⁸

The basic condition for having preferences is the ability to categorize the perceived environment. In a study by Kaplan and Kaplan⁹ which explored perceptions of the environment, criteria for the development of categories,

1 cf.: D. Scholz: *Landschaft als ästhetisches Ereignis, Ein Beitrag zur Psychologie landschaftsästhetischer Wirkung, Beiträge zur räumlichen Planung, Heft 53, Hannover, 1998*; Kaplan & Kaplan: *The Experience of Nature, A Psychological Perspective, Ulrich, 1995*; Raimund Rodewald: *Paysage à votre santé - ein Projekt zur Gesundheits- und Landschaftsförderung, In: Naturschutz und Gesundheit, Heft 65, Bonn-Bad Godesberg, 2008*; Appleton, J.: *The Experience of Landscape, New York, 1975, Wiley*; Bauer, N., Martens, D.: *Die Bedeutung der Landschaft für die menschliche Gesundheit- Ergebnisse neuester Untersuchungen der WSL, Forum für Wissen, 2010, p. 43 - 51*

2 Schwarze, M., Rüdüsili, H-P.: *Grünraum in der Stadt - Erhalten, Gestalten und Nutzen, Bericht 29 des NFP, Stadt und Verkehr, Zürich, 1992, p.7*

3 6th European Public Health Conference: *Health in Europe: are we there yet? Learning from the past, building the future, Session Health determinants and the Environment, 11.2013, Brussels*

4 Gyimóthy, A.: *Psychological Health of Urban Inhabitants, European Journal of Public Health, Vol. 23, Supplement 1, 2013*

5 Rodewald, R.: *Paysage à votre santé - ein Projekt zur Gesundheits- und Landschaftsförderung In: Erdmann, K-H.*

et al.: Naturschutz und Gesundheit: Eine Partnerschaft für mehr Lebensqualität, Heft 65, Naturschutz und biologische Vielfalt, BfN, Bonn, 2008

6 Szilágyi, K., Zelenák, E., Kanczlerné Veréb, M., Gerzson, L., Balogh, P.I., Czeglédi, Cs.: *Limits of ecological load in public parks - on the example of Városliget, in Applied Ecology and Environmental Research, 2014*

7 cf. Gyimóthy, A.: *Auswirkungen der wahrgenommenen städtischen Natur auf den psychosozialen Empfindungsbereich, Hat Natur Platz in der Stadt?, Verlag Dr. Kovac, Hamburg, 2010, p.75*

8 Resolution ‚Lebenswerte Stadt von Morgen‘, Partnerregionen-Konferenz, Bad Langensalza, 05.2009

9 Kaplan, R., Kaplan, S.: *The Experience of Nature, A Psychological Perspective, Ulrich's Bookstore, 1995*



such as function, age, type of the built surroundings and vegetation, were proposed. The results of this study show that neither the size, nor the order or maintenance of an open space is authoritative for categorization. Two factors were, however, important, which determine categorization and with it, preference: the balance (relationship) between the built and the natural elements and the arrangement of the natural surroundings themselves. „How is the type of environment perceived? It would seem reasonable that the underlying commonalities would be on the basis of function - what activities one might carry out. The result of this study showed that the size of open space was not a factor in itself; nor was the tidiness or maintenance of the area. Rather, the results suggested that the basis for grouping was related to two factors: the balance between the buildings and the natural areas and the arrangement of the natural area itself.“¹⁰

RESEARCH METHODOLOGY

The empirical study explained in this article focuses on the open space type, 'city square'. The study involved 700 test subjects.¹¹ The aim was to understand,

following Siebel,¹² whether the landscape scenes and the city scenes, as a contrasting pair, generate different reactions in the subjects' perceptions. The survey, carried out on the basis of pictures of real situations, such as city squares with greenery (209 test subjects¹³), city squares without greenery (207 test subjects¹⁴) and non-urban countryside scenes (196 test subjects¹⁵), measures the effect on our well-being and the subjectively-valued attractiveness of the situations.

Three different slideshows were prepared, each with 20 images of diverse European environments with three typical environmental sets: landscapes, city squares without any greenery and city squares with greenery. Before the experiment, participants completed a questionnaire about their psychological well-being and added some demographic data about themselves. Then the participants were randomly divided into three groups. Each participant saw one of the slideshows depending on which group they had been assigned to.

After the slide shows, the participants judged the images they had seen in terms of attractiveness. They then filled out the questionnaire that would measure their well-being (bad-good

mood scale) (Multidimensional Mood State Questionnaire of Steyer).

MEASUREMENT OF WELL-BEING

First of all, the test subjects, without any pre-selection, completed the short form of Rolf Steyer's¹⁶ Multidimensional Mood State Questionnaire (MDBF) on-line, which served to capture the baseline mood of the test subjects.¹⁷ After this pre-test¹⁸ and collection of the socio-demographic data the test subjects moved on to one of three different slideshows which were created with the help of a random generator. This random choice could not be influenced by the test subject nor was it discernibly integrated by him/her. In the slide shows, our mentally stored and evocable concepts are activated, namely through language, i.e. certain words generate certain images. This creates a sort of 'image language' where the words, landscape (1st slide show), city squares without any greenery / (2nd slide show) and city squares with greenery (3rd slide show) are encoded in a slide show. Every slide show signifies a word and, therefore, stands, in pictorial language, for a term. The aim of the slide show is to stimulate the generated mood by a concept linked to the

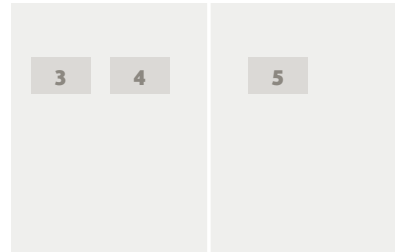


Figure 3-5:
A sequence from the second slideshow (city squares without greenery)

respective word and through this to offer the opportunity to measure the mood.

Each slide show contains 20 photos, which are each shown for four seconds. This should allow for an overall impression that fades out the details consciously (there is little time for precise observation), thus promoting the link with the concept. The photos have been selected to cover thoroughly the possible facets of the concept. In the pictures of the first slide show, which should generate the link with landscape scenes, there are different seasons, times of day and different typical European sceneries and scenery typologies. In addition to these seasonal and temporal variations, the empty city squares in the second slide show originate from different historical periods. The same criteria for the choice of the situations form the basis of the third slide show. (Fig. 1-10)

After the test-subjects have watched the respective slideshows, their well-being values are measured again and the results noted according to which slide show was watched. The test subjects who completed the test only before or after watching the slide shows were not considered in the evaluation analysis and were therefore assigned to no group. This contributed to the randomization.

The MDBF examines three dimensions of the psychological mood: good-bad mood (GS), consciousness-tiredness (WM) and the rest-restlessness (RU). Primarily, the GS values are of relevance to this study, because they describe the well-being of the test subjects.

WELL-BEING BEFORE THE EXPERIMENT

The GS values of the pre-test show differences in the average sorted by the three groups even before the experiment. This means, there are differences in the baseline characteristics. Although the choice of the test subjects was random, the group allocation within the experiment was carried out only at a later stage and without knowledge of the test subject; therefore, the differences in the baseline characteristics are not relevant to the analysis. (Tab. 1.)

The fact that the average GS values in the groups varied, or were even contradictory, pre-test and post-test leads to the supposition bias that some baseline characteristics exert systematic influence on the test subjects. Gender and age seem to exert the most systematic influence; although additional tests identified well-being, gender

10 Kaplan, R., Kaplan, S.: *The Experience of Nature, A Psychological Perspective*, Ulrich's Bookstore, 1995

11 The investigation was carried out in 2010 in the form of an on-line questioning with combined method in four languages. S. Gyimóthy, A.: *Auswirkungen der Wahrgenommenen städtischen Natur auf den psychosozialen Empfindungsbereich*, Kovac, 2010, Hamburg

12 Siebel, W.: *Die europäische Stadt*, Suhrkamp, Frankfurt, 2004, p. 12 „What is a city, arises from the difference to the non-city, to the country; what is the European from the difference to the cities of other societies.“ Siebel lists five characteristics which describe the ideal type of the European city. The characteristics about the urbane lifestyle and about the contrast of city and country are to be considered by this implementation by these characteristics.

13 Test persons to the 3rd slide show (city squares with greenery) passed on

14 Test persons to the 2nd slide show (city squares without portion in natural elements) passed on

15 Test persons to the 1st slide show (landscapes) passed on

16 Steyer, R., Schwenkmetzger, P., Notz, P., Eid, M.: *Der Mehrdimensionale Befindlichkeitsfragebogen (MDBF)*. Handanweisung; Göttingen, Hogrefe, 1997

17 Instead of the originally developed 5-stage answer scale of the MDBF page its developed 6-stage form was used here.

18 in the farther pre-test

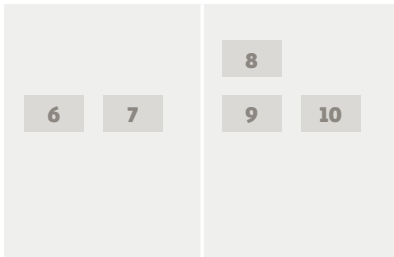


Figure 6-10:
A sequence from the third slideshow (city squares with greenery)



and age as three independent variables, meaning these are not just influences. The tests on the other socio-demographic data of the subjects supported this result. They exert no conditioned effects on the well-being before the experiment i.e. before watching the slide shows. The differences in the pre-test average of the GS values can be explained by pure chance. Nevertheless, it is important to hold the GS pre-test values steady (constant) in further analyses and to take the adjusted averages as a comparative basis in order to balance the differences in the baseline characteristics.

WELL-BEING AFTER THE EXPERIMENT

The first test group, which saw the landscape scenes, reacted on the GS scale with increased averages. Watching the landscape scenes and the links created by the experience of scenery and memories and associations with the scenery

generated an increased feeling of well-being in the test subject. (Tab. 2.)

The second test group, which saw random images of city squares without any green or natural elements, showed a significant deterioration in the averages on the GS scale. Watching images of city squares with no greenery created links with the experiences of such city squares and related memories and associations. This reduced the feeling of well-being in the test subjects.

The third test group, which watched images of city squares with greenery scored higher on the GS scale of the MDBF than before the experiment, i.e., their viewing experiences improved their actual feelings of well-being. Watching images of city squares that included greenery created links with the experience by green city squares and memories and associations with green city squares. This increased the well-being of the test subjects.

The data of all three groups was checked for significance using the

general linear model of SPSS. The differences in the averages on the GS scale for the respective test groups before and after the experiment were checked using ANOVA (Analysis of Variance). The results show that the described connections could not have occurred by chance, but were due to the experiences the subjects underwent in the experiment, namely, the slide shows (Fig.11.)

The study and its results show that the definitions of city and countryside are neither dichotomous or mutually exclusive and therefore not especially useful when aiming at a sustained health-supporting planning of urban open spaces. The reactions of the test subjects to city squares with a greenery are similarly positive to, if less strong than reactions to the landscape representations. Future-oriented and sustained plans for urban spaces should recognize the qualities of integrative design. It is not necessary for city squares to be viewed as deficient. The city square should be seen as a bearer of possible



qualities that could fulfill basic human needs in the urban open space and thus promote the feelings of well-being.

ATTRACTIVENESS AND WELL-BEING

In light of the above, some might argue that city squares are attractive because of their urban character, the cultural opportunities they represent, their thrilling architecture and the promise of urban life, not because of the trees! These supporters of the urban scene would be quite right. The fact that cities, in particular city centers, meet our cultural needs, is widely accepted. Thus, we have to question the subjective evaluation of the attractiveness of the respective situations in this experiment. The approximated subjective attractiveness votes are linked to the values of well-being after the experiment in the different groups. The calculations indicate that in all three test groups there is a significant connection between the approximated attractiveness

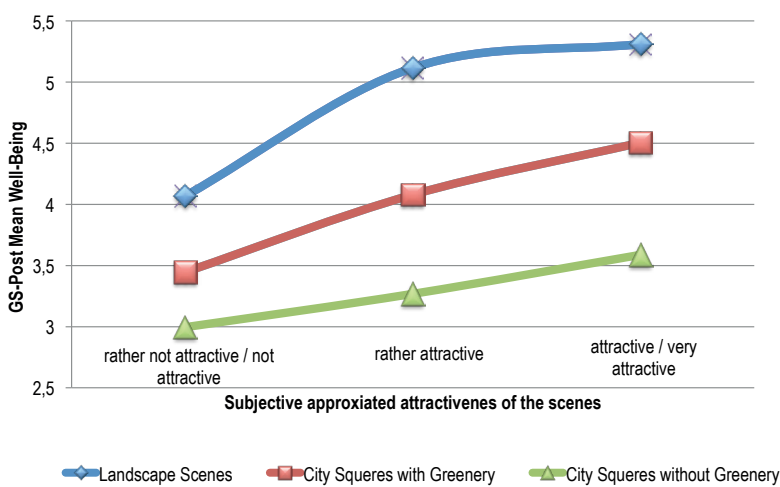
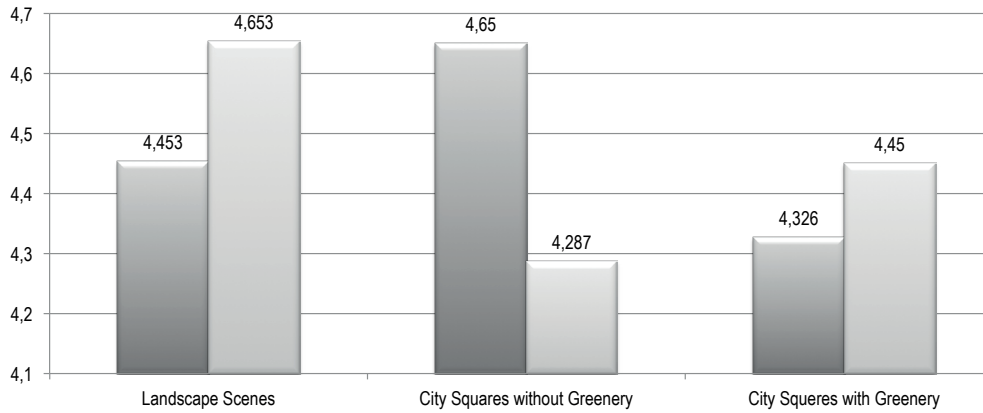
of the images and the feeling of well-being after the experiment. (Fig.12.)

This result seems to confirm what seems obvious. Nevertheless, when considering the diagram above, yet another connection is discovered, one that points to a hidden tension between perception and well-being.

LINES OF ATTRACTIVENESS

The values in well-being after the viewings could be linked with attractiveness lines, i.e., a line connects the values of test subjects who have valued the images of the slide show with the same attractiveness category, showing the hidden tension between subjective evaluation and measured well-being. The people on the same attractiveness line show different perceptions of well-being. The test subjects from the same attractiveness line are different test groups. The first group shows the highest averages on the GS scale, the third group is in

Landscape Scenes	City Squares without Greenery	City Squares with Greenery
4,453	4,65	4,326
4,653	4,287	4,45



second place and the second test group has the lowest perception of well-being within the same category of attractiveness. Though previous investigations showed that the approximated attractiveness correlates positively in all test groups with well-being, nevertheless, the strong effect of the respective slide show or the associations linking it with real surroundings cannot be disregarded. Thus, even if a slide show or the associations linked with it were valued attractively, the feeling of well-being was different, namely, it was dependent on which open space type was represented by the slide show. (Fig.13.)

SUMMARY

Approximately 700 participants completed the online survey. They all had a European background but spoke different languages.

One of the main questions in the survey was to understand the impact

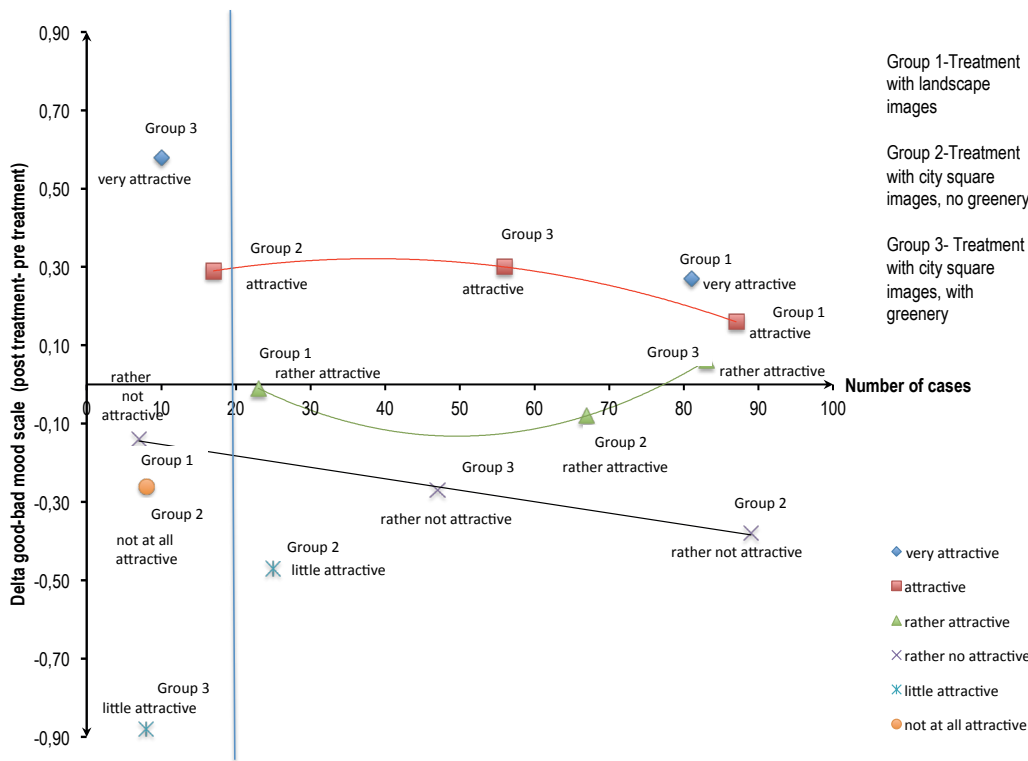
on well-being in different urban and non-urban surroundings: Does a certain type of environment influence our mood (psychological well-being) in a positive or negative way?

To answer this question, three different slideshows were prepared, each with 20 images of diverse European environments with three typical environmental sets: landscapes, city squares without any greenery and city squares with greenery. Before the experiment, participants completed a questionnaire about their psychological well-being and added some demographic data about themselves. Then the participants were randomly divided into three groups. Each participant saw one of the slideshows depending on which group they had been assigned to.

After the slide shows, the participants judged the images they had seen in terms of attractiveness. They then filled out the questionnaire that would measure their well-being (bad-good mood scale) (Multidimensional Mood State Questionnaire of Steyer).

The evaluation showed some interesting findings; some were self-evident and others were quite surprising. First of all, we can say that looking at landscape images generates a good mood. After the slideshow with landscape images, the participants reached a significantly higher value on the bad-good mood scale. Similar results were observed after the slideshow with images of city squares that had high amounts of greenery. However, there was a very surprising finding with regard to the squares without any greenery. After this slideshow, participants reported a significantly lower value on the bad-mood scale. This means, they felt worse after looking at images of city squares without any greenery.

In addition to these correlations, the changes after a slideshow with a particular setting and the values of the perceived attractiveness of the same images were compared: The higher the perceived attractiveness of a show, the higher the increase in mood.



Variable	Group of treatment	Mean	Std. Error	Std. Deviation
GS-Pre	1	4.453	0.071	0.992
GS-Pre	2	4.650	0.056	0.799
GS-Pre	3	4.326	0.070	1.008

Variable	Group of Treatment	Mean	Std. Error	Std. Deviation	Adj. Mean	Std. Error2
GS-Post	1	4.636	0.063	0.880	4.653	0.044
GS-Post	2	4.413	0.058	0.828	4.287	0.050
GS-Post	3	4.350	0.063	0.911	4.450	0.050

The groups with the same level of perceived attractiveness were analyzed, for instance, every person who gave a 'very attractive' evaluation of their sets, belonged to the same group. Both landscape and city squares with greenery generated a better mood. However, within that group of participants who gave a 'very attractive' evaluation, the change on the good-bad mood scale was higher for those participants treated with the city squares with greenery. This suggests that landscapes deserve a high aesthetic value in our European culture, a view that is supported by the impact that greenery has on our psychological well-being. Put differently, city squares with greenery do not receive the aesthetic acknowledgment that they should, based on the measured values on the bad-good mood scale. Also, the impact of city nature or greenery should not be underestimated. At present, there is a gap between the basic needs, psychological needs and cultural values in European cultural understandings.

FURTHER VIEW / DISCUSSION

The more attractively one of three open space types is deemed, the more intensely an aesthetic feeling is generated. This leads directly to a successful acceptance of the surroundings which, in turn, is responsible for feelings of well-being. Certain situations, irrespective of attractiveness, generate a lower aesthetic feeling and fewer positive feelings, both of which influence the well-being. It means that the highest possible intensity of the acceptance process depends on the stimulus. The connections and cultural shifts between open space type, well-being and attraction cause an inexplicable tension between the appreciation of an urban situation without any greenery and lower feelings of well-being. Further research would be necessary to be able to identify, well-being indicators', which can intensify the acceptance process and increase feelings of well-being.

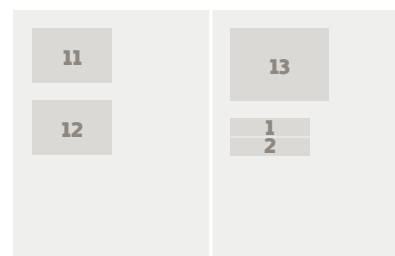


Figure 11: Mean-values at the GS-scale (well-being) of MDBF before and after the treatment

Figure 12: Connection between subjective, approximated attractiveness and well-being after the treatment

Figure 13: Lines of attractiveness: Correlations between well-being after the treatment, subjective, approximated attractiveness and type of open space

Table 1: Good-Bed Mood Values (GS Scale of MDBF) of the baseline characteristics (GS-Pre) (calculated with EffectLite)

Table 2: Good-Bed Mood Values (GS Scale of MDBF) after the treatment (GS-Post) (calculated with EffectLite)