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Physical Culture, Sport and Recreation in the Sustainable Transformation of a Post-Industrial City: Residents' Expectations Towards the European City of Science Katowice 2024

Robert Roczniok [1,*], Wojciech Chudy [2], Artur Terbalyan [1,*], Grzegorz Mikrut [3], Daria Manilewska [1] and Joanna Kantyka [2]

[1] Institute of Sport Science, The Jerzy Kukuczka Academy of Physical Education in Katowice, 40-065 Katowice, Poland; dmanilewska@gmail.com
[2] Faculty of Management and Innovation in Healthcare, The Jerzy Kukuczka Academy of Physical Education in Katowice, 40-065 Katowice, Poland; w.chudy@awf.katowice.pl (W.C.); j.kantyka@awf.katowice.pl (J.K.)
[3] Department of Sport Management, Faculty of Physical Education and Sport, Charles University, 128 00 Prague, Czech Republic; grzegorz.mikrut@ftvs.cuni.cz
* Correspondence: r.roczniok@awf.katowice.pl (R.R.); a.terbalyan@awf.katowice.pl (A.T.)

Abstract

Post-industrial cities increasingly present science, health and physical activity as engines of sustainable transformation, yet residents' own expectations are rarely measured before programmes are designed. This study examined how the inhabitants of Katowice (Poland) and people functionally linked with the city view the sciences of physical culture as a resource for the sustainable transformation of a post-industrial city, and modelled their expectations in the fields of physical culture, sport and recreation in the run-up to the city's designation as European City of Science 2024. A convergent mixed-methods design (November 2022) combined a non-probability, mixed-mode survey of 500 respondents (a broad and diverse, but not representative, sample) with focus groups involving 130 residents, sector representatives and elite athletes. Exploratory principal component analysis identified four dimensions explaining 58.2% of the variance (α = 0.85–0.90): perceived quality of the current offer, demand for development, valuation of physical-culture science and health, and institutional and ambassadorial visibility; a sensitivity analysis using polychoric correlations and oblique rotation reproduced the allocation of 29 of the 30 items, although the structure still requires confirmatory validation. Valuation of science and health was the highest-rated dimension (M = 4.20) and rose with education and age (ε^2 = 0.13 for both). Self-rated physical activity was the only predictor significant across three of four dimensions in adjusted models, although the explained variance was modest (R^2 = 0.06–0.17). Only 35.2% of respondents were satisfied with health-promoting classes, whereas 80.6–90.0% rated health-related knowledge and healthy ageing as important, suggesting a possible mismatch between priorities and perceived provision. The findings are translated into five context-specific pillars for health-oriented policy in Katowice and into conditional lessons for other post-industrial cities.

Keywords: sustainable city; physical culture; sport policy; recreation; quality of life; healthy ageing; urban green space; post-industrial transformation; European City of Science; citizen participation

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1. Introduction

Cities concentrate the majority of the world's population and, with it, the majority of the health, social and environmental burdens that the 2030 Agenda for Sustainable Development seeks to reduce [1]. Sustainable Development Goal 3 (good health and well-being) and Sustainable Development Goal 11 (sustainable cities and communities) intersect precisely where urban policy meets everyday movement behaviour: in the design of streets, parks and sports facilities, in the programming of events, and in the distribution of expert knowledge about health. The urgency of that intersection has grown. Physical inactivity is responsible for a global economic burden estimated at INT$ 53.8 billion per year in health-care costs and productivity losses [2], and a pooled analysis of 507 population-based surveys covering 5.7 million participants showed that the prevalence of insufficient physical activity among adults rose to 31.3% in 2022, so that the world is not on track to meet the 15% relative reduction target set by the Global Action Plan on Physical Activity for 2030 [3,4]. Current guidelines therefore treat any increase in activity as beneficial and place explicit emphasis on population-level, environmental and policy measures [5]. Physical inactivity is thus not only a clinical problem but a governance problem: the evidence that city planning is a determinant of population health, and that walkable, green and well-equipped urban environments are associated with substantially higher activity across very different cities, has moved the issue into the domain of urban policy [6,7], where it is increasingly addressed through the Healthy Cities paradigm and Health in All Policies approaches [8–10].

Evidence on how the urban environment shapes activity and well-being has matured considerably. A meta-narrative synthesis of urban green-space interventions found consistent benefits for physical activity, health and well-being, but also that the social and equity effects depend on how interventions are designed and who is involved in designing them [11]. Systematic and meta-analytic work indicates that green and blue physical activity improves quality of life [12], while population studies link access to green space with leisure-time activity, mental health and body weight [13–15]. Adherence to green-space exposure rules has been associated with better mental health, higher physical activity and lower overweight prevalence [16], and spatially explicit assessments show that the equitable distribution of open space is as important as its quantity [17]. Quality, not merely proximity, drives use: park quality and greenery predict children's activity [18,19], perceived public-space quality and disorder shape adult use [20], and inequalities in quality and proximity are frequently more pronounced than inequalities in the sheer amount of green space [21]. Longitudinal analyses of urban greening confirm that these resources are dynamic and require deliberate protection as cities grow [22]. For older residents, green space is one of the few settings in which restorative physical activity remains feasible across chronic-disease status, and it is consistently associated with healthy ageing outcomes [23,24]; the literature on green space and ageing has itself become an object of bibliometric synthesis [25], although equity gaps in this evidence base persist [26]. Green space is, moreover, not only a setting for activity but also a component of green infrastructure that delivers ecosystem services and supports environmental resilience, which links the health agenda of SDG 3 with the environmental agenda of SDG 11 [27].

A second body of work concerns sport events and the symbolic economy of cities. The legacy literature has long distinguished between the tangible and intangible, planned and unplanned, positive and negative outcomes that events leave in a host city [28], and has argued that social benefits do not follow automatically from hosting but must be deliberately leveraged through programmes that connect the event to the community [29]. Reviews of residents' perceptions of sporting events show, consistently with this, that support is contingent on perceived social and quality-of-life benefits rather than on economic rhetoric [30],

and place branding through sport events has been systematised as a field with distinct antecedents and outcomes [31]. Small-scale events can function as branding platforms in their own right [32], and non-mega events have been shown to influence residents' quality of life and their support for hosting [33]. Recent evidence links residents' perceptions of major events to their own sport participation behaviour [34], while volunteering initiatives and social perception studies illustrate the mechanisms through which event legacies are, or are not, realised [35,36]. This literature converges with place-branding research showing that residents are a distinct and often overlooked brand constituency, that a single brand rarely fits all resident segments, and that civic pride and sense of place mediate the acceptance of city image strategies [37–40]. For the argument developed here, this literature matters because events are one of the principal channels through which post-industrial cities redefine themselves; residents' expectations of events therefore cannot be separated from their expectations of the city's broader transformation.

A third strand concerns the governance of sport and physical activity at the municipal level, and the role of universities within it. Comparative sport-policy scholarship has long distinguished between "podium" and "participation" priorities and has documented how urban policy regimes shape cultural and sport provision [41–43]. In Poland, leisure-time physical activity participation has risen only slowly and remains socially stratified [44], national sport policy remains strongly centralised while delivery is municipal [45], and analyses of local-government expenditure on physical activity promotion between 2015 and 2020 revealed a persistent mismatch between spending patterns and residents' opinions [46]; similar tensions have been described in other Central and Eastern European systems [47]. Universities enter this field through their "third mission"—the transfer of knowledge and engagement with society beyond teaching and research—whose potential for regional development is well documented but whose realisation is constrained by weak incentives and unclear governance arrangements [48]. Participatory planning research shows that the geography of citizen engagement is uneven and that digital participation reaches beyond, but also reproduces, the "backyard" logic of local interest [49], and science-communication scholarship points out that citizens' pathways to scientific knowledge are plural and institutionally mediated [50]. Inclusion is a further governance test: information about the accessibility of sports facilities is itself a determinant of use for people with disabilities [51], and the quality rather than the quantity of participation predicts subjective well-being in this population [52,53]. Taken together, these strands suggest that the infrastructure of physical culture, its events and its knowledge institutions are interdependent urban resources whose contribution to sustainable development depends on how residents perceive and use them.

Katowice, the core city of the Upper Silesian conurbation, is an instructive case at the meeting point of these literatures. The conurbation is a textbook post-industrial region whose small and medium towns are still negotiating the passage between industrialism and post-industrialism [54], and whose building stock and brownfields are being reprogrammed as drivers of sustainable urban transformation [55]. Having hosted COP24 in 2018 and the World Urban Forum in 2022, the city was awarded the title of European City of Science 2024 together with the right to host the EuroScience Open Forum, on the basis of a consortium of public higher-education institutions with the University of Silesia as leader and the City of Katowice as strategic partner; the programme of the title was explicitly framed as a transformation instrument, with science presented as the region's "new industry", the reconstruction of urban space as a democratic and health-supporting environment, and citizen science as a dialogue tool [56]. Physical culture, sport and recreation occupy an ambivalent position in such programmes. They are highly visible in a city that identifies with the Spodek arena and with major championships, yet they are seldom treated as a scientific domain with its own research infrastructure and its own claim on urban policy.

This creates a specific evidence gap. Studies of urban physical activity typically measure behaviour or environmental exposure; studies of event legacies typically measure support and image; studies of sport governance typically analyse documents and budgets. Comparatively few studies ask residents directly what they expect from the scientific and institutional infrastructure of physical culture in their own city, fewer still do so before a large-scale programme is designed, and fewer again establish the latent structure of those expectations rather than reporting item-by-item frequencies. The combination of a factor-analytic survey with focus groups is intended to address these gaps together. Resident-perception studies in the event literature typically model support as a single construct predicted by perceived benefits [30,33], and municipal surveys usually report item frequencies [46]; identifying the latent dimensions of expectations shows instead whether residents distinguish between the evaluation of provision, demand for its development, the value attached to expert knowledge and the visibility of institutions. The qualitative strand gives access to the reasoning of sector organisations and athletes, which a residents' survey cannot capture, and thus helps to interpret the mechanisms behind survey patterns. The originality of the study lies in treating the sciences of physical culture as an urban resource in their own right, alongside infrastructure, green space and events, and in asking how residents expect that resource to contribute to the sustainable transformation of a post-industrial city. The research reported here was commissioned by the City of Katowice from The Jerzy Kukuczka Academy of Physical Education in Katowice for exactly that purpose, and was carried out in November 2022, that is, after the title had been secured but before the 2024 programme had been fixed.

The analytical framework of the study is summarised in Figure 1. It links three levels. The transformation context, comprising the sustainability agenda of SDG 3 and SDG 11 [1,8–10], the post-industrial reprogramming of urban space [54,55] and the science-city strategy of the European City of Science [56], shapes the urban resources of physical culture: infrastructure and green infrastructure [11–27], events and place branding [28–40], and knowledge and representation, embodied in the third mission of universities and in athletes acting as city ambassadors [48]. Residents experience and evaluate these resources, and their expectations, conditioned by individual characteristics such as physical activity, education and life stage, form the level measured in this study. Expectations, in turn, are an input into participatory, health-oriented urban policy, which is expected to support physical activity and health and, through them, a sustainable and resilient urban transformation [6,7,57]. Needs assessment, citizen participation and legacy monitoring close the loop by feeding residents' perspectives back into the programme [49,50]. The framework is heuristic: the study measures expectations and their correlates, not the causal paths between the levels.

The aim of the study was to identify, analyse and model the needs and expectations of the inhabitants of Katowice and of people functionally linked with the city and the region towards the programme assumptions of the European City of Science Katowice 2024 in the fields of physical culture, sport and recreation. Five research questions were posed:

RQ1. Which public institutions do residents identify as fulfilling the mission of physical culture, sport and recreation in the city?
RQ2. Which dimensions, identified exploratorily, structure residents' expectations towards physical culture, sport and recreation, and are the resulting subscales internally consistent?
RQ3. How do residents evaluate the existing sport, recreation and event infrastructure of Katowice, and where are their needs strongest?
RQ4. Which respondent characteristics are associated with those expectations, both bivariately and after mutual adjustment, and how large are the effects?

RQ5. What expectations do residents, sector organisations and elite athletes formulate with respect to the role of science, infrastructure, events and sporting ambassadors in the sustainable development of the city?

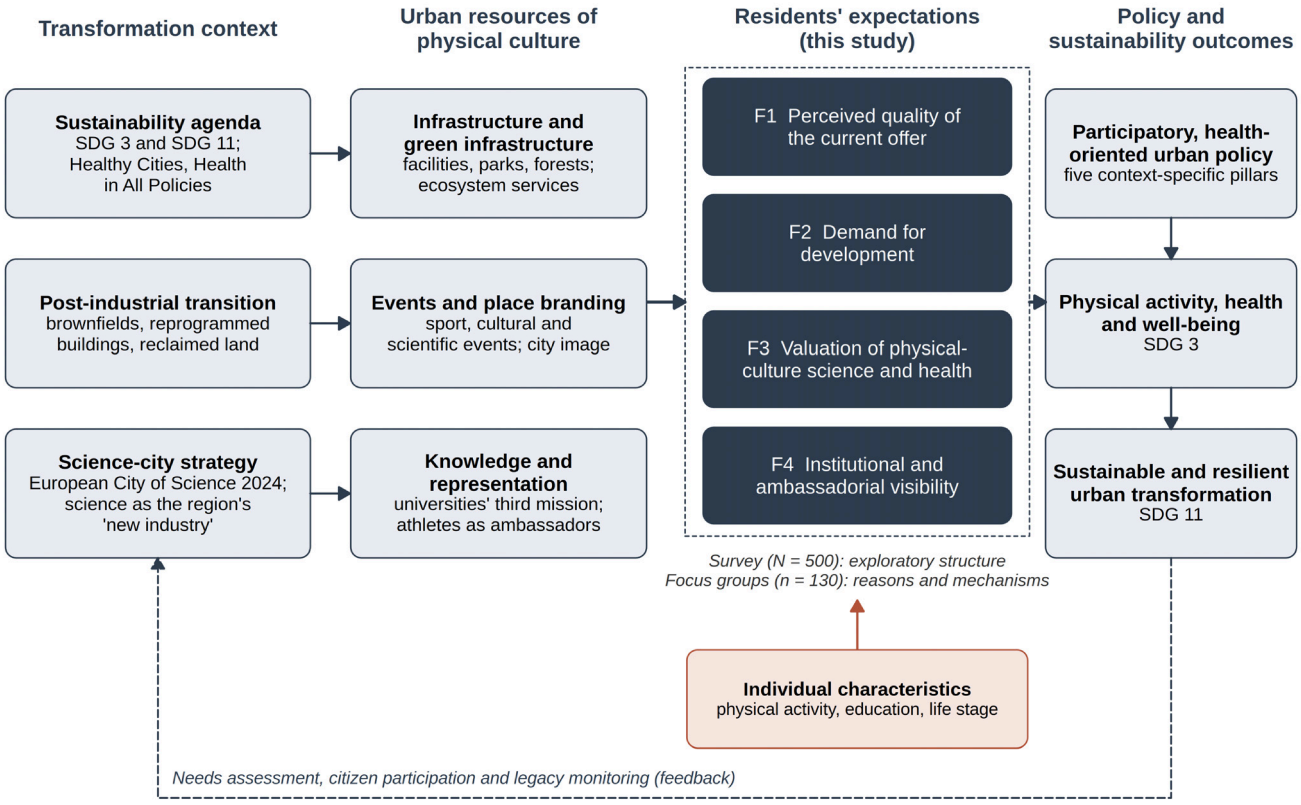


Figure 1. Analytical framework of the study. The transformation context shapes the urban resources of physical culture, which residents experience and evaluate; residents' expectations, measured here as four exploratory dimensions and conditioned by individual characteristics, inform participatory, health-oriented urban policy and, through it, physical activity, health and sustainable urban transformation. The dashed line denotes feedback through needs assessment, citizen participation and legacy monitoring. The arrows indicate hypothesised relationships, which were not tested causally. Color coding denotes analytical categories: dark blue boxes represent the focal dimensions of residents' expectations evaluated in this study (F1–F4), light gray boxes indicate contextual determinants, resources, and policy outcomes, and the orange box denotes individual moderating characteristics.

2. Materials and Methods

2.1. Study Design

A convergent parallel mixed-methods design was applied [58], in which a quantitative strand (diagnostic survey) and a qualitative strand (focus-group interviews) were conducted in the same period, analysed separately and integrated at the interpretation stage. The design follows the logic of a needs assessment commissioned to inform a public programme, so that breadth (a broad and diverse distribution of opinions) and depth (institutional and expert reasoning) could be obtained simultaneously. Both strands were carried out between 6 and 30 November 2022 in Katowice, Poland. Katowice is the capital of the Silesian Voivodeship and the core municipality of the Upper Silesian–Zagłębie Metropolis. At the time of the study the resident population used for sampling purposes was 289,162 [59]. The city combines a dense legacy of heavy industry with a large concentration of higher-education institutions and with venues of national significance for sport and entertainment, including the Spodek arena and, in the immediate vicinity, the Silesian Stadium. The Jerzy Kukuczka Academy of Physical Education in Katowice is the

only higher-education institution in the region whose statutory mission is defined in terms of physical culture, sport and recreation, and it is a member of the consortium that secured the European City of Science 2024 title [56].

The study was commissioned and funded by the City of Katowice (Katowice City Hall) in connection with the implementation of contract PPS/18/2022 as a needs assessment for the programme of the European City of Science Katowice 2024. The city defined the subject and scope of the assessment, namely residents' expectations in the fields of physical culture, sport and recreation. City Hall representatives did not comment on the draft questionnaire or the interview guides, and the city's website and social-media profiles were among the channels through which the on-line questionnaire was disseminated. The development of the questionnaire and interview guides, recruitment, fieldwork, data entry, coding and all analyses were carried out by the research team of The Jerzy Kukuczka Academy of Physical Education in Katowice. The city received the final project report; after its delivery, the city consented to the secondary use of the anonymised statistical material for the purpose of this article. The city had no role in the analyses reported here, the interpretation of the data, the writing of the manuscript or the decision to publish. Because the research team is affiliated with the Academy, which was also one of the institutions evaluated in the survey, the potential for affiliation bias is discussed in Section 4.5.

2.2. Participants

The target population comprised inhabitants of Katowice and persons functionally linked with the city and the region, including representatives of sector organisations and athletes of the first and master sport classes associated with the city. Functional linkage was understood as working, studying or regularly using sport, recreation and cultural services in Katowice while residing elsewhere, which is common in the polycentric Upper Silesian–Zagłębie Metropolis. Residence status was not recorded as a separate variable in the questionnaire, so the numbers of residents and of functionally linked persons among the 500 survey respondents cannot be reported, and the two groups could not be compared analytically; they were analysed jointly as users of the city's offer in physical culture, sport and recreation. For this reason, and because recruitment was non-probabilistic, the survey sample is treated throughout as a broad and diverse local needs-assessment sample rather than as a representative sample of the resident population.

Data were collected using a mixed technique combining face-to-face administration by trained interviewers with a self-completed on-line questionnaire, in order to reach both digitally active and less digitally active segments of the population. Face-to-face questionnaires were administered by interviewers from the Academy in public spaces in the city centre, at sport and recreation facilities, on university campuses and in senior clubs, where paper questionnaires were also distributed for self-completion; the on-line version was disseminated through the websites and social-media profiles of the city and of the Academy and through sport clubs and organisations. The mode of completion was not stored as a case-level variable; consequently, the share of each mode cannot be determined from the data file, and mode effects could not be tested. Because recruitment was open, the number of persons invited is unknown and a response rate cannot be computed. The final data file was screened for duplicated records and invariant response patterns (see Data Preparation). No quotas and no geographical, socio-economic or demographic stratification criteria were applied during fieldwork. Such a design is exposed to self-selection: on-line respondents select themselves on the basis of interest in the topic and digital activity, while the composition of the face-to-face sample depends on the places and times at which interviewers work [60,61]. Young, educated and physically active respondents were therefore likely to be over-represented, as was confirmed by the structure of the realised

sample (Section 3.1); all estimates are accordingly interpreted as describing the structure of expectations within this sample rather than population values. Participation was voluntary and anonymous; no personal identifiers were recorded. The realised sample was 500 respondents.

For the qualitative strand, six respondent strands were defined and focus-group interviews were conducted in groups of 6–10 participants. In total, 130 participants took part: residents aged 15–18 years (n = 9), 19–26 years (n = 36), 27–65 years (n = 21) and 66 years and over (n = 7); representatives of sector organisations operating in physical culture, sport and recreation (n = 16); and first-class and master-class athletes linked with Katowice (n = 41). Participants were recruited purposively within each strand. Inclusion criteria were residence in, or functional linkage with, Katowice; membership of the respective age or stakeholder strand; and, for athletes, first-class or master-class sport status and affiliation with a Katowice club. The interviews were conducted face-to-face. Each was led by a moderator from the research team experienced in qualitative interviewing, who followed the semi-structured interview guide described below and was supported by an assistant taking notes; the discussions were recorded with the participants' consent, transcribed verbatim and additionally documented in detailed written notes.

The study was conducted as a commissioned needs assessment in accordance with the Declaration of Helsinki. It was an anonymous, non-interventional opinion study (survey and group interviews) that collected no health or other sensitive personal data. Participation was voluntary, respondents were informed of the purpose and of the anonymous character of the survey, and informed consent was obtained before participation (for the survey, by agreeing to complete the questionnaire after reading the information provided; for the focus groups, orally before the interview). Participants aged 15–17 years took part with the written consent of a parent or legal guardian and gave their own consent; participants aged 18 years and over consented on their own behalf. After delivery of the final project report, the City of Katowice consented to the secondary use of the anonymised statistical material for this article, so the analyses reported here are retrospective analyses of existing data. Ethical review and approval were waived for this study as per the guidelines issued by the National Science Centre, Poland (Narodowe Centrum Nauki, NCN; Guidelines for Applicants to Complete the Ethics Issues Form in the Proposal, December 2021), because it involved only the analysis of existing, anonymised secondary data made available under the municipal commission.

2.3. Sample Size and a Priori Power Analysis

Two independent criteria were applied to determine the required sample size.

First, the sample size that would be required to estimate a proportion in a finite population with a 5% margin of error under simple random sampling was calculated as [62]

$$n = (N \cdot Z^2 \cdot p \cdot (1 - p))/(\mathrm{d}^2 \cdot (N - 1) + Z^2 \cdot p \cdot (1 - p)),$$

where N = 289,162, Z = 1.96 (95% confidence level), p = 0.5 (maximum-variance fraction) and d = 0.05 (maximum estimation error). The calculation yielded n = 383.7, that is, a minimum of 384 respondents; the result was confirmed independently with an on-line sample-size calculator.

Second, an a priori power analysis was performed for each planned inferential test, with a two-tailed α = 0.05 and a target power of $1 - \beta$ = 0.80, using the effect-size conventions of Cohen [63]. For the detection of a small-to-moderate correlation (r_s = 0.15) 347 participants were required; for a comparison of two independent groups at the observed sex ratio (270:230) and a small-to-moderate effect (d = 0.30) 354 participants were required for a parametric test and 371 for its rank-based equivalent, applying the asymptotic rela-

tive efficiency of 0.955 of the Mann–Whitney U test [64]; for a four-group comparison at f = 0.15 ($\varepsilon^2 \approx 0.022$) 489 participants were required; and for a multiple regression with nine predictors at $f^2 = 0.05$ ($R^2 \approx 0.048$) 322 participants were required. The largest of these requirements (489) and the finite-population minimum (384) were both exceeded by the realised sample of 500. Because the sample was not drawn at random, exceeding these values ensures adequate statistical power for the planned tests but does not establish representativeness. The one exception is the test of independence in a 4 × 6 contingency table (df = 15), for which the detection of a small association (w = 0.15) would have required 837 participants; with $N = 500$ that test was powered to detect $w \geq 0.194$, and the corresponding results are interpreted with this restriction in mind. Post hoc, the achieved power was ≥0.99 for all regression models, ≥0.98 for the significant Kruskal–Wallis comparisons involving the demand and valuation dimensions, and 1.00 for the strongest correlations observed ($r_s = 0.34$–0.36).

2.4. Instrument

An author-designed questionnaire was developed for the study. It contained 38 substantive items and a socio-demographic section. Two items were single-choice institutional questions (which public university in Katowice is best qualified to deliver the mission of physical culture, sport and recreation; which university most inspires and stimulates the local community to undertake physical activity and sport), two items were dichotomous (diversification of the offer of sport organisations and of sport clubs), one item concerned the most important category of events organised in the city, three items were open-ended (the person and discipline associated with the role of city ambassador; the sporting symbol of Katowice; an example of the most important event organised in the city), and the remaining 30 items were measured on five-point ordinal scales.

Four parallel scale wordings were used and coded uniformly from 1 to 5: a degree scale (1 = very low to 5 = very high), a needs scale (1 = very small to 5 = very large), an evaluation scale (1 = very bad to 5 = very good) and an importance scale (1 = not important to 5 = very important). The socio-demographic section recorded age bracket, sex, education, marital status, material situation, self-rated quality of life, occupational status, self-rated physical activity level and household size.

The items were developed specifically for this needs assessment, because no existing instrument covered the combination of institutional, infrastructural, event-related and health-related expectations defined in the commissioning brief. Item generation followed a deductive logic based on the framework in Figure 1: the institutional items drew on the literature on the third mission of universities and on science communication [48,50]; the paired items on the evaluation, use and development of indoor facilities, outdoor facilities and recreational areas drew on the evidence on activity-supportive urban environments and green space [6,7,11–21]; the items on the evaluation and effects of events drew on the event-legacy and residents'-perception literature [28–34]; the importance items on research, healthy ageing and wellness knowledge drew on the health-promotion and healthy-ageing agenda [4,5,23,24]; and the items on athletes as ambassadors drew on place-branding research [37–40]. For each domain, parallel items were formulated for the evaluation of the current offer, declared needs and perceived importance, so that supply and demand could be contrasted. Content validity was addressed through a review of the draft questionnaire by experts from the Department of Methodology, Statistics and Informatics of the Academy who were involved in the study, and through a pilot study, which led to minor wording changes. The complete questionnaire, in the original Polish and in English translation, with all response options, is provided as Supplementary File S1.

The qualitative interview guides were derived from the same thematic structure. Residents and sector organisations were asked about the institution fulfilling the mission of physical culture, the importance of permanent care for health well-being and participation in prevention programmes, the significance of the city's sport and recreation infrastructure, the city's capacity to develop that infrastructure and to organise events, and the role of athletes in promoting the city, the region and science. Athletes were additionally asked what they do and what they propose for the promotion of the city, the region, science, physical culture, sport and recreation.

2.5. Data Preparation

The raw data file (47 variables, 500 cases) was checked for out-of-range and implausible values. Two values of household size (20 and 1357 persons) were treated as missing, leaving $n = 498$ for that variable; 17 respondents (3.4%) did not answer the open question on the sporting symbol of the city and 60 (12.0%) the open question on the most important event, and these were excluded from the corresponding percentages. There were no missing values on the 30 ordinal items or on the remaining socio-demographic variables. The file contained no fully duplicated records; one pair of consecutive records was identical on the 30 ordinal items and the socio-demographic variables but differed in four other answers, and both were retained. Nineteen respondents (3.8%) gave the same answer to all 30 ordinal items (straight-lining), a pattern that may indicate careless responding [65]. They were retained in the main analyses, and the dimensional and multivariable analyses were repeated without them (Section 3.4; Table S3).

Free-text answers to the three open questions were coded independently into thematic categories using a keyword-based coding scheme; every original answer was assigned to exactly one category, and residual answers were grouped as "other". For the question on the person and discipline associated with the city ambassador, 161 respondents (32.2%) explicitly answered "none"; percentages for that item are reported for the 339 respondents who named a person or a discipline.

2.6. Statistical Analysis

Categorical and ordinal variables were described using counts and structure indicators (percentages); ordinal items were additionally summarised with means, standard deviations, medians and interquartile ranges. All 30 ordinal items departed significantly from normality (Shapiro–Wilk, all $p < 0.001$) and were negatively skewed (skewness from -1.80 to -0.07), so non-parametric procedures were used throughout.

The latent structure of the 30 ordinal items was examined by exploratory principal component analysis (PCA) with varimax rotation [66]. PCA was chosen because the primary purpose of the commissioned analysis was data reduction, that is, the construction of a small number of composite scores for reporting to the city, rather than the estimation of a measurement model; when latent constructs are of interest, common-factor analysis is conceptually more appropriate [67], and it was therefore used in the sensitivity analysis described below. Varimax rotation was retained for comparability with the original project report and because it maximises the simplicity of item allocation. Sampling adequacy was verified with the Kaiser–Meyer–Olkin measure [68] and Bartlett's test of sphericity [69]. The number of components was determined by parallel analysis [70], comparing the observed eigenvalues with the 95th percentile of the eigenvalues of 500 random correlation matrices of the same dimensions; the Kaiser criterion was reported for comparison. Items were assigned to the component on which they loaded most strongly, with one exception retained on conceptual grounds and reported explicitly in Section 3.4; secondary loadings within 0.10 of the primary loading were flagged. Internal consistency of the resulting subscales

was assessed with Cronbach's α [71] and McDonald's ω [72,73], and subscale scores were computed as item means on the original 1–5 metric. Because the items are ordinal and skewed, and because the resulting subscales were expected to correlate, the robustness of the solution was examined in a sensitivity analysis: exploratory factor analysis (EFA) of the polychoric correlation matrix [74] with minimum-residual extraction and oblique (oblimin) rotation, supplemented by weighted-least-squares and maximum-likelihood extraction and by promax and geomin rotations. The number of factors was re-examined with parallel analysis of the polychoric matrix and with Velicer's minimum average partial (MAP) criterion [75], and the similarity of the solutions was assessed with Tucker's congruence coefficient ($\geq$0.95, good similarity; 0.85–0.94, fair similarity [76]). Ordinal α and ω were computed from the polychoric matrix. We also examined whether the conclusions changed when the item whose assignment departed from its highest loading was assigned by that loading or excluded. These analyses were run in R 4.3.3 with the psych (version 2.4.3) and GPArotation (version 2024.3-1) packages [77,78]. Throughout, the component structure is treated as exploratory: internal consistency does not establish construct validity, stability or measurement invariance.

Associations between ordinal variables were assessed with Spearman's rank-order correlation coefficient, with 95% confidence intervals obtained by Fisher's z transformation. Differences by sex were tested with the Mann–Whitney U test, with the standardised test statistic Z corrected for ties, and effect sizes expressed as $r = |Z|/\sqrt{N}$ and as the rank-biserial correlation. Differences by age group, education, marital status and occupational status were tested with the Kruskal–Wallis analysis of variance, with epsilon-squared ($\varepsilon^2 = H/(n-1)$) as the effect size [79] and Dunn's test with Bonferroni correction for pairwise comparisons [80]. Associations between categorical variables were tested with Pearson's chi-square test of independence, with Cramér's V and its bias-corrected version [81] as effect sizes; where expected counts below five occurred, p-values were additionally obtained by Monte Carlo simulation with 5000 replicates [82].

To establish which respondent characteristics remained associated with expectations after mutual adjustment, each subscale was regressed on nine predictors (age, education, material situation, quality of life, physical activity level, household size, sex, employment and partnership status) in a multiple linear model with standardised continuous variables; multicollinearity was assessed with variance inflation factors, and model effect size was expressed as Cohen's f^2 [63]. The categorical preference for a type of event was additionally modelled with binary logistic regression (sporting events versus all other categories), with odds ratios and 95% confidence intervals. As an exploratory extension, we examined whether model fit improved when interactions of physical activity with age, education and sex were added, when age and education were entered as categorical variables, and when two further respondent-level variables available in the dataset (preference for sporting events and the inability to name a city ambassador) were added (Table S4).

Because 24 correlation tests and 34 sex comparisons (30 individual items and the 4 subscales) were performed, the Benjamini–Hochberg false discovery rate procedure was applied within each of these families, and adjusted q-values are reported alongside nominal p-values [83]. The significance level was set at $\alpha = 0.05$. The original analyses were carried out in Statistica v.13.1, and all figures were produced in R 4.3.3 with the ggplot2 package.

The qualitative material was analysed thematically [84]. Transcribed statements were coded into the categories defined by the interview guide, the frequency with which institutions and arguments were mentioned was tabulated, and representative verbatim statements were selected to illustrate each category. Categories were then compared across the three respondent groups (residents, sector organisations, athletes) to identify convergent and divergent expectations. Percentages reported for the qualitative strand are descriptive

summaries of the views expressed in the interviewed groups, computed with the number of participants of the given strand who addressed the question as the denominator; they are not population estimates. The two strands were integrated at the interpretation stage by means of a joint display [85], in which each principal survey finding was juxtaposed with the corresponding qualitative material and classified as convergent, divergent or complementary.

3. Results

3.1. Characteristics of the Sample

The socio-demographic structure of the quantitative sample (N = 500) is presented in Table 1. The largest age group was 19–26 years (46.6%), followed by 27–65 years (33.4%), 15–18 years (12.8%) and 66 years and over (7.2%). Women constituted 54.0% and men 46.0% of the sample. Almost half of the respondents declared secondary education (48.8%) and a further 42.2% higher education. Single respondents predominated (64.6%), followed by married (26.0%), divorced (6.0%) and widowed respondents (3.4%). Just under half were in employment (49.0%), 43.0% were not working (a category that includes pupils and students), 5.4% were retired and 2.6% were disability pensioners. Households of two to four persons accounted for 75.1% of the sample (n = 498).

Self-assessments were predominantly positive. Material situation was rated good by 45.4% and very good by 11.8% of respondents, while only 2.6% rated it very bad and 4.2% bad. Quality of life was rated good by 53.2% and very good by 18.0%, against 2.0% very bad and 1.8% bad. Physical activity level was rated high by 37.4% and very high by 18.2%, average by 37.8%, low by 5.2% and very low by 1.4%. The sample therefore consisted predominantly of respondents who were, by their own account, moderately to highly active and satisfied with their living conditions—a point of importance for the interpretation of the associations reported below.

Table 1. Socio-demographic characteristics of the sample (N = 500).

Characteristic	Category	*n*	%
Age	15–18 years	64	12.8
	19–26 years	233	46.6
	27–65 years	167	33.4
	66 years and over	36	7.2
Sex	Female	270	54.0
	Male	230	46.0
Education	Primary	36	7.2
	Vocational	9	1.8
	Secondary	244	48.8
	Higher	211	42.2
Marital status	Single	323	64.6
	Married	130	26.0
	Divorced	30	6.0
	Widowed	17	3.4
Occupational status	Not working (incl. pupils and students)	215	43.0
	Working	245	49.0
	Disability pensioner	13	2.6
	Retired	27	5.4
Material situation	Very bad	13	2.6
	Bad	21	4.2
	Average	180	36.0
	Good	227	45.4
	Very good	59	11.8

Table 1. *Cont.*

Characteristic	Category	*n*	%
Self-rated quality of life	Very bad	10	2.0
	Bad	9	1.8
	Average	125	25.0
	Good	266	53.2
	Very good	90	18.0
Self-rated physical activity level	Very low	7	1.4
	Low	26	5.2
	Average	189	37.8
	High	187	37.4
	Very high	91	18.2
Household size (n = 498)	1	52	10.4
	2	118	23.7
	3	127	25.5
	4	129	25.9
	5	51	10.2
	6	17	3.4
	7	4	0.8

Two implausible values of household size (20 and 1357 persons) were treated as missing.

3.2. Institutional Attribution of the Mission of Physical Culture

Asked which public university in Katowice is best qualified to deliver the mission of physical culture, sport and recreation, 95.0% of respondents (n = 475) indicated The Jerzy Kukuczka Academy of Physical Education in Katowice; the second-ranked institution, the University of Silesia, was named by 2.2% (n = 11). Asked which university most inspires and stimulates the local community to undertake physical activity and sport, 93.6% (n = 468) again indicated the Academy of Physical Education, against 2.4% for the University of Silesia. The attribution was therefore effectively unanimous, notwithstanding the fact that sport organisations operate at all the public universities of the city.

3.3. Descriptive Structure of Responses

Descriptive statistics for the 30 ordinal items are reported in Table 2 and their full response distributions in Figure 2, in both cases grouped by the dimensions established in Section 3.4.

Table 2. Descriptive statistics for the 30 ordinal items (N = 500). Response distributions are shown in Figure 2.

Item	M	SD	Md	IQR
F1 Perceived quality of the current offer				
Indoor facilities meet expectations	3.40	0.90	3	3–4
Outdoor facilities meet expectations	3.47	0.84	3	3–4
Recreational areas meet expectations	3.65	0.84	4	3–4
Rating of sport events	3.95	0.81	4	3–5
Rating of recreational events	3.80	0.77	4	3–4
Rating of cultural events	3.95	0.84	4	3–5
Rating of entertainment events	3.95	0.84	4	4–5
Sport and recreation events meet expectations	3.62	0.76	4	3–4
Cultural and entertainment events meet expectations	3.67	0.78	4	3–4
Health-promoting classes meet expectations	3.25	0.90	3	3–4

Table 2. *Cont.*

Item	M	SD	Md	IQR
F2 Demand for development				
Need: use of indoor facilities	3.59	0.94	4	3–4
Need: use of outdoor facilities	3.63	0.98	4	3–4
Need: use of recreational areas	3.96	0.93	4	3–5
Need: development of indoor facilities	3.72	0.91	4	3–4
Need: development of outdoor facilities	3.73	0.92	4	3–4
Need: development of recreational areas	3.93	0.90	4	3–5
Need: development of the sport and recreation event offer	3.70	0.80	4	3–4
Need: development of the cultural and entertainment offer	3.70	0.84	4	3–4
F3 Valuation of physical-culture science and health				
Importance of research in the sciences of physical culture	4.19	0.86	4	4–5
Instilling passion contributes to quality of life	4.02	0.88	4	4–5
Importance of participation in healthy-ageing programmes	4.23	0.84	4	4–5
Importance of care for healthy ageing	4.44	0.80	5	4–5
Importance of raising knowledge about wellness and fitness	4.13	0.84	4	4–5
F4 Institutional and ambassadorial visibility				
Universities fulfil the quality-of-life mission	3.52	0.86	4	3–4
Universities provide access to knowledge and science	3.57	0.84	4	3–4
Events increase interest in sport and recreational activity	3.78	0.85	4	3–4
Sport events influence tourist attractiveness	3.97	0.90	4	4–5
Athletes are ambassadors of the city	3.50	1.03	4	3–4
Athletes are ambassadors of physical culture and sport	3.58	0.97	4	3–4
Recognisability of “People of Sport”	3.21	1.04	3	3–4

M = mean; SD = standard deviation; Md = median; IQR = interquartile range. All items were scored 1–5.

The highest-rated items in the entire questionnaire concerned health and knowledge rather than provision: care for healthy ageing (M = 4.44, SD = 0.80; 90.0% important or very important), participation in healthy-ageing programmes (M = 4.23, SD = 0.84; 83.6%), research and the deepening of knowledge in the sciences of physical culture (M = 4.19, SD = 0.86; 82.0%), and the continuous raising of knowledge about wellness and physical fitness (M = 4.13, SD = 0.84; 80.6%). The perceived contribution of instilling passion for physical activity to urban quality of life was also high (M = 4.02, SD = 0.88; 76.2%), as was the perceived influence of sport events on the tourist attractiveness of the city (M = 3.97, SD = 0.90; 75.6%).

The lowest-rated items concerned the existing supply. The offer of health-promoting classes met respondents’ expectations to a large or very large degree for only 35.2% of the sample (M = 3.25, SD = 0.90), with 49.6% choosing the middle category and 15.2% a small or very small degree. Indoor sport and recreation facilities met expectations for 46.4% (M = 3.40, SD = 0.90) and outdoor facilities for 46.8% (M = 3.47, SD = 0.84), in both cases with the modal answer in the middle category. Recreational areas—parks, squares, forests and meadows—performed better (58.4%; M = 3.65, SD = 0.84). The recognisability of “People of Sport” associated with Katowice had the lowest mean in the questionnaire (M = 3.21, SD = 1.04; 41.6% high or very high, 23.2% low or very low).

Needs were uniformly high and hierarchically ordered. The strongest needs concerned recreational green areas: 71.0% of respondents declared large or very large needs with respect to their use (M = 3.96, SD = 0.93) and the same proportion with respect to their development (M = 3.93, SD = 0.90), with the “very large” category alone selected by 32.4% and 29.0% respectively. Needs relating to the development of indoor facilities, outdoor facilities and the offer of sport and recreation events were each declared as large or very large by 62.6% of respondents, and the development of the cultural and entertainment offer

by 62.4%. In every domain the declared need for development equalled or exceeded the declared need for use, indicating that residents perceive the current stock as a constraint rather than as saturated.

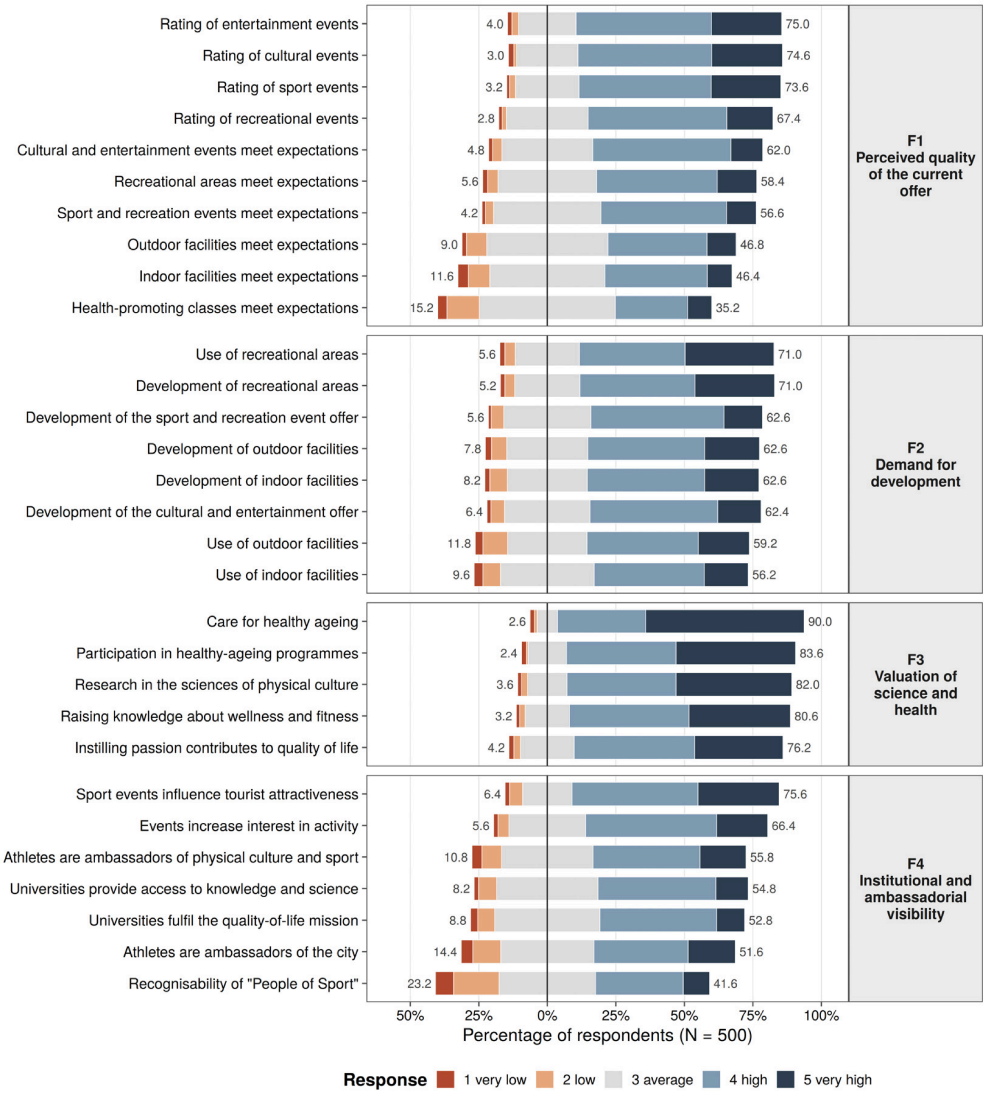


Figure 2. Response distributions of the 30 ordinal items, grouped by the four dimensions identified in Section 3.4 (N = 500). Bars are centred on the middle response category, which is split symmetrically about the zero line; figures at the ends of each bar give the percentage of negative (1–2) and positive (4–5) answers. Within each dimension items are ordered by the share of positive answers.

Figure 3 contrasts, domain by domain, the share of respondents satisfied with the existing offer with the share declaring a large or very large need for its development. Because the paired items differ in wording (evaluation versus declared need), these contrasts describe the relative pressure on each domain rather than measured deficits. The difference was negligible for cultural and entertainment events (+0.4 percentage points) and larger for sport facilities and green areas (+12.6 to +16.2 points). For health-promoting classes, the questionnaire contained no matching development item. Satisfaction with these classes (35.2%) was the lowest of all items, whereas the importance attached to health-related knowledge (80.6%) and to healthy ageing (83.6–90.0%) was among the highest; this suggests a possible mismatch between residents' priorities and the offer they perceive, but because the indicators measure different constructs, the difference between them is not quantified.

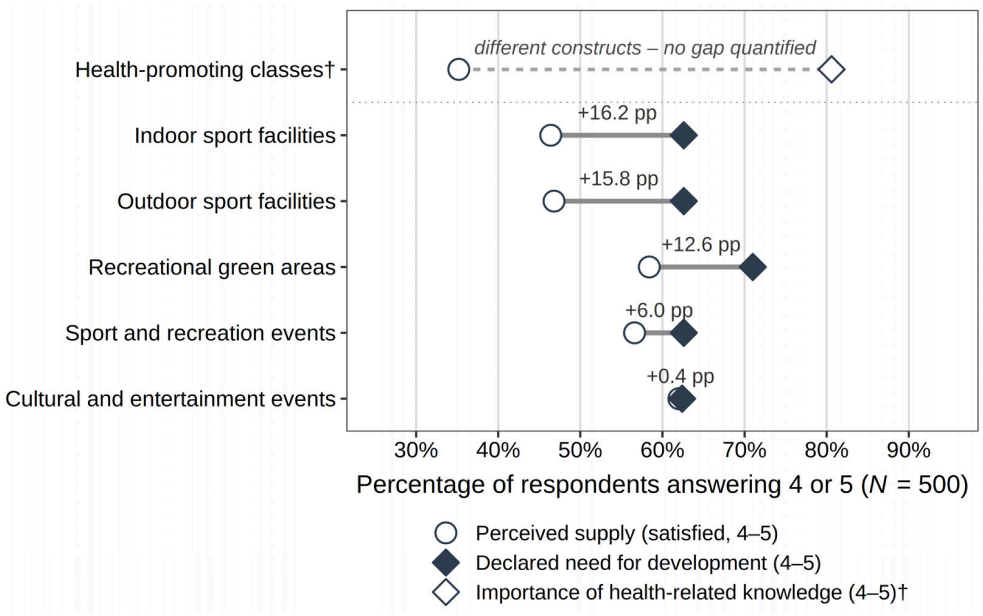


Figure 3. Perceived supply and declared need, by domain (N = 500). Open circles give the percentage of respondents satisfied with the existing offer (answers 4–5 on the corresponding "meets expectations" or rating item), filled diamonds the percentage declaring a large or very large need for the development of the same domain; differences are given in percentage points (pp) and are descriptive, because the paired items differ in wording. † For health-promoting classes the questionnaire contained no matching development item; the open diamond shows the declared importance of continuously raising knowledge about wellness and physical fitness, a different construct, so no gap is quantified.

Finally, 95.8% of respondents stated that the offer of sport organisations in Katowice should be diversified in terms of sport disciplines, and 92.8% that the offer of sport clubs should be diversified, for example through multi-section clubs.

3.4. Dimensional Structure and Reliability

The 30 ordinal items were suitable for dimension reduction: the Kaiser–Meyer–Olkin measure was 0.913 and Bartlett's test of sphericity was significant, $\chi^2(435) = 9159.6$, $p < 0.001$. The Kaiser criterion indicated six components, whereas parallel analysis against the 95th percentile of 500 random correlation matrices indicated four; the four-component solution was retained as the more parsimonious and the more interpretable, and explained 58.2% of the total variance (eigenvalues 10.81, 3.32, 1.88 and 1.46).

The rotated solution (Table 3; Figure 4A) showed a largely simple structure. Component 1, perceived quality of the current offer (10 items), grouped the evaluations of facilities, recreational areas and all four categories of events. Component 2, demand for development (eight items), grouped all the needs items relating to the use and development of facilities, green areas and the event offer. Component 3, valuation of physical-culture science and health (five items), grouped the importance attributed to research in the sciences of physical culture, to healthy ageing and its programmes, to wellness knowledge, and to the motivational function of sport. Component 4, institutional and ambassadorial visibility (seven items), grouped the evaluation of the universities' mission and knowledge provision with the perceived role and recognisability of athletes as ambassadors.

Table 3. Principal component analysis with varimax rotation: rotated loadings, communalities and internal consistency (N = 500, 30 items).

Item	C1	C2	C3	C4	h^2
F1 Perceived quality of the current offer (α = 0.90, ω = 0.92)					
Indoor facilities meet expectations	0.54	0.16	0.01	0.23	0.37
Outdoor facilities meet expectations	0.48	0.25	0.05	0.31	0.39
Recreational areas meet expectations	0.46	0.23	0.07	0.23	0.33
Rating of sport events	0.66	0.15	0.21	0.31	0.60
Rating of recreational events	0.74	0.13	0.18	0.29	0.69
Rating of cultural events	0.79	0.01	0.27	0.06	0.71
Rating of entertainment events	0.81	0.05	0.12	0.16	0.69
Sport and recreation events meet expectations	0.67	0.21	0.11	0.41	0.67
Cultural and entertainment events meet expectations	0.79	0.18	0.08	0.19	0.70
Health-promoting classes meet expectations [a]	0.43	0.27	−0.04	0.49	0.50
F2 Demand for development (α = 0.89, ω = 0.91)					
Need: use of indoor facilities	0.08	0.72	0.08	0.17	0.55
Need: use of outdoor facilities	0.08	0.73	0.10	0.15	0.57
Need: use of recreational areas	0.11	0.66	0.36	−0.08	0.58
Need: development of indoor facilities	0.11	0.79	0.13	0.19	0.69
Need: development of outdoor facilities	0.09	0.79	0.14	0.13	0.67
Need: development of recreational areas	0.11	0.68	0.37	0.02	0.61
Need: development of the sport and recreation event offer	0.26	0.61	0.25	0.21	0.55
Need: development of the cultural and entertainment offer	0.29	0.51	0.27	0.09	0.43
F3 Valuation of physical-culture science and health (α = 0.85, ω = 0.90)					
Importance of research in the sciences of physical culture	0.13	0.24	0.73	0.15	0.63
Instilling passion contributes to quality of life	0.18	0.20	0.62	0.26	0.53
Importance of participation in healthy-ageing programmes	0.14	0.17	0.82	0.05	0.72
Importance of care for healthy ageing	0.16	0.14	0.82	0.03	0.71
Importance of raising knowledge about wellness and fitness	0.13	0.30	0.61	0.22	0.52
F4 Institutional and ambassadorial visibility (α = 0.86, ω = 0.89)					
Universities fulfil the quality-of-life mission	0.36	0.05	−0.06	0.59	0.48
Universities provide access to knowledge and science	0.40	0.06	−0.02	0.61	0.53
Events increase interest in sport and recreational activity	0.32	0.37	0.25	0.48	0.53
Sport events influence tourist attractiveness	0.30	0.28	0.33	0.41	0.45
Athletes are ambassadors of the city	0.20	0.12	0.17	0.79	0.70
Athletes are ambassadors of physical culture and sport	0.19	0.13	0.27	0.75	0.68
Recognisability of "People of Sport"	0.22	0.14	0.02	0.77	0.66

Loadings in bold mark the component to which the item was assigned. Kaiser–Meyer–Olkin = 0.913; Bartlett's test of sphericity $\chi^2(435) = 9159.6$, $p < 0.001$. Eigenvalues of the retained components: 10.81, 3.32, 1.88, 1.46; total variance explained 58.2%. The number of components was determined by parallel analysis (95th percentile of 500 random correlation matrices). h^2 = communality; α = Cronbach's alpha; ω = McDonald's omega. [a] The only item whose highest loading (0.49 on C4) did not determine its assignment; it was assigned to C1 (0.43) on conceptual grounds. Results under alternative assignments of item [a] are given in Table S2, and the polychoric-based sensitivity analysis in Figure 4B and Table S1.

Internal consistency was good to excellent in every dimension: Cronbach's α ranged from 0.85 to 0.90 and McDonald's ω from 0.89 to 0.92. One item—satisfaction with the offer of health-promoting classes—loaded marginally higher on Component 4 (0.49) than on Component 1 (0.43). It was nevertheless assigned to Component 1 on conceptual grounds: it asks whether the existing offer meets expectations and is worded and scaled in the same way as the other "meets expectations" items of Component 1, whereas Component 4 groups evaluations of universities and athletes; its cross-loading plausibly reflects the fact that such classes are partly delivered by universities and sport organisations. Assigning the item by its highest loading (to Component 4) or excluding it changed the α of the affected subscales by at most 0.01 and did not alter the rank order of the subscale means. Of the 24 Spearman correlations with respondent characteristics, only one changed significance

(material situation with perceived quality, $r_s = 0.09$, q = 0.046, became significant); in the multivariable models, quality of life became a significant predictor of perceived quality ($\beta = 0.125$, $p = 0.035$), while all other significant predictors were unchanged. The remaining differences concerned small age effects: the age difference in perceived quality was no longer significant ($p = 0.086$), and, when the item was assigned to Component 4, a small age difference emerged for institutional visibility ($H(3) = 8.40$, $p = 0.038$, $\varepsilon^2 = 0.017$) (Table S2). The substantive conclusions are therefore unaffected. One further item—the influence of sport events on tourist attractiveness—had a secondary loading within 0.10 of its primary loading (0.41 on Component 4 versus 0.33 on Component 3); no other item did.

	A PCA, varimax				B EFA (polychoric), oblimin			
	F1	F2	F3	F4	F1	F2	F3	F4
Indoor facilities meet expectations	**0.54**	0.16	0.01	0.23	**0.48**	0.10	−0.08	0.14
Outdoor facilities meet expectations	**0.48**	0.25	0.05	0.31	**0.39**	0.19	−0.05	0.21
Recreational areas meet expectations	**0.46**	0.23	0.07	0.23	**0.37**	0.16	−0.01	0.15
Rating of sport events	**0.66**	0.15	0.21	0.31	**0.66**	0.04	0.06	0.16
Rating of recreational events	**0.74**	0.13	0.18	0.29	**0.77**	0.02	0.05	0.11
Rating of cultural events	**0.79**	0.01	0.27	0.06	**0.88**	−0.12	0.17	−0.13
Rating of entertainment events	**0.81**	0.05	0.12	0.16	**0.88**	−0.06	−0.01	−0.02
Sport and recreation events meet expectations	**0.67**	0.21	0.11	0.41	**0.63**	0.13	−0.04	0.27
Cultural and entertainment events meet expectations	**0.79**	0.18	0.08	0.19	**0.85**	0.11	−0.08	−0.02
Health-promoting classes meet expectations	0.43	0.27	−0.04	**0.49**	0.32	0.22	−0.17	**0.40**
Need: use of indoor facilities	0.08	**0.72**	0.08	0.17	−0.04	**0.72**	−0.06	0.08
Need: use of outdoor facilities	0.08	**0.73**	0.10	0.15	−0.02	**0.73**	−0.02	0.03
Need: use of recreational areas	0.11	**0.66**	0.36	−0.08	0.03	**0.67**	0.24	−0.20
Need: development of indoor facilities	0.11	**0.79**	0.13	0.19	−0.03	**0.85**	−0.06	0.06
Need: development of outdoor facilities	0.09	**0.79**	0.14	0.13	−0.04	**0.84**	−0.02	0.00
Need: development of recreational areas	0.11	**0.68**	0.37	0.02	0.02	**0.70**	0.22	−0.11
Need: development of sport/recreation event offer	0.26	**0.61**	0.25	0.21	0.18	**0.61**	0.08	0.07
Need: development of cultural/entertainment offer	0.29	**0.51**	0.27	0.09	0.23	**0.48**	0.13	−0.04
Importance of research in physical-culture sciences	0.13	0.24	**0.73**	0.15	0.02	0.15	**0.67**	0.09
Instilling passion contributes to quality of life	0.18	0.20	**0.62**	0.26	0.06	0.10	**0.55**	0.21
Importance of healthy-ageing programmes	0.14	0.17	**0.82**	0.05	0.02	0.02	**0.86**	0.02
Importance of care for healthy ageing	0.16	0.14	**0.82**	0.03	0.04	−0.01	**0.88**	0.00
Importance of wellness and fitness knowledge	0.13	0.30	**0.61**	0.22	0.01	0.20	**0.52**	0.16
Universities fulfil the quality-of-life mission	0.36	0.05	−0.06	**0.59**	0.25	−0.01	−0.14	**0.53**
Universities provide access to knowledge	0.40	0.06	−0.02	**0.61**	0.29	−0.01	−0.12	**0.55**
Events increase interest in activity	0.32	0.37	0.25	**0.48**	0.19	0.31	0.13	**0.37**
Sport events influence tourist attractiveness	0.30	0.28	0.33	**0.41**	0.20	0.21	0.23	**0.29**
Athletes are ambassadors of the city	0.20	0.12	0.17	**0.79**	−0.01	−0.01	0.14	**0.81**
Athletes are ambassadors of physical culture	0.19	0.13	0.27	**0.75**	−0.01	−0.01	0.23	**0.76**
Recognisability of “People of Sport”	0.22	0.14	0.02	**0.77**	0.02	0.04	−0.04	**0.79**

Loading −0.5 0.0 0.5

Figure 4. Item loadings on the four dimensions. (**A**) Principal component analysis with varimax rotation (Pearson correlations; loadings as in Table 3). (**B**) Sensitivity analysis: exploratory factor analysis of polychoric correlations with minimum-residual extraction and oblimin rotation (pattern loadings). Bold values mark the highest loading of each item; horizontal lines separate the dimensions to which the items were assigned. F1, perceived quality of the current offer; F2, demand for development; F3, valuation of physical-culture science and health; F4, institutional and ambassadorial visibility.

The robustness of the solution was examined in the sensitivity analysis (Figure 4B; Table S1). EFA of the polychoric correlation matrix (KMO = 0.876) with minimum-residual extraction and oblimin rotation reproduced the four-dimensional structure: 29 of the 30 items loaded most strongly on the factor corresponding to their component, the only exception again being satisfaction with health-promoting classes (0.40 on the institutional factor versus 0.32 on the perceived-quality factor). Tucker's congruence coefficients between the PCA and EFA solutions were 0.96, 0.98, 0.94 and 0.95 for F1–F4. The factors were positively correlated (r = 0.19–0.57), which supports an oblique model, and together accounted for 59.0% of the variance (root mean square of residuals = 0.051). Solutions obtained with promax or geomin rotation and with weighted-least-squares extraction allocated 28–29 of the 30 items identically (congruence 0.88–0.98); with maximum-likelihood extraction, 27 items were allocated identically, the two university items and the item on events increasing interest in activity changing factors. Ordinal α and ω ranged from 0.88 to 0.92.

The number of dimensions was less clear-cut for the common-factor model: parallel analysis of the polychoric matrix supported four components but up to seven factors, the MAP criterion changed only marginally beyond four factors (0.026 for four and 0.025 for seven), and likelihood-based fit indices indicated that four common factors do not reproduce the correlation matrix closely (RMSEA = 0.13). In the five- to seven-factor solutions, the dimensions of demand for development and of the valuation of science and health remained intact, whereas perceived quality separated into an event-evaluation facet and a facilities-and-areas facet, and institutional visibility into university, event-effect and athlete facets. The four dimensions are therefore best read as a parsimonious exploratory summary, in which F2 and F3 are robust and F1 and F4 are broader composites. Excluding the 19 straight-lining respondents left the component structure unchanged (all 30 items allocated identically; congruence $\geq$ 0.99), and internal consistency remained good (α = 0.82–0.88) (Table S3).

Descriptive statistics and inter-correlations of the four subscales are reported in Table 4. The rank order is itself a finding: residents valued the science and health dimension most highly (M = 4.20, SD = 0.67), followed by demand for development (M = 3.75, SD = 0.67) and perceived quality of the current offer (M = 3.67, SD = 0.60), with institutional and ambassadorial visibility lowest (M = 3.59, SD = 0.69). All four dimensions were positively inter-correlated (r_s = 0.29–0.66, all $p < 0.001$); the strongest association linked perceived quality with institutional visibility (r_s = 0.66) and the weakest linked perceived quality with the valuation of science and health (r_s = 0.29), suggesting that satisfaction with what exists and the value attached to health knowledge are relatively distinct judgments.

Table 4. Descriptive statistics and Spearman inter-correlations of the four subscales (N = 500).

Subscale	M	SD	Md	IQR	Skew	F1	F2	F3	F4
F1 Perceived quality of the current offer	3.67	0.60	3.70	3.30–4.03	−0.64	—	0.36	0.29	0.66
F2 Demand for development	3.75	0.67	3.88	3.25–4.12	−0.69	0.36	—	0.50	0.42
F3 Valuation of physical-culture science and health	4.20	0.67	4.20	3.80–4.80	−1.33	0.29	0.50	—	0.37
F4 Institutional and ambassadorial visibility	3.59	0.69	3.57	3.14–4.00	−0.60	0.66	0.42	0.37	—

All inter-correlations $p < 0.001$. Subscale scores are item means on the original 1–5 metric.

3.5. Correlates of the Four Dimensions

Spearman correlations between the subscales and respondent characteristics are shown in Figure 5.

The valuation of physical-culture science and health was the dimension most strongly structured by respondent characteristics. It rose with education (r_s = 0.361, 95% CI [0.282, 0.435], q < 0.001) and with age (r_s = 0.340, 95% CI [0.260, 0.415], q < 0.001), and fell with

household size (r_s = −0.200, 95% CI [−0.283, −0.114], q < 0.001); weaker but significant associations were found with material situation, quality of life and physical activity level (r_s = 0.117–0.145, q ≤ 0.014).

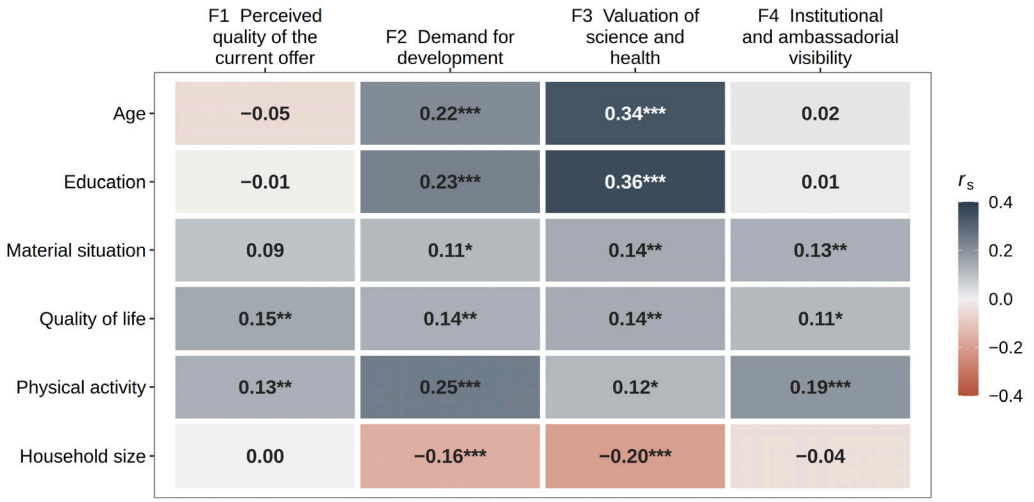


Figure 5. Spearman rank-order correlations between the four subscales and respondent characteristics (*N* = 500; household size *n* = 498). Asterisks denote significance after Benjamini–Hochberg correction across all 24 tests: * q < 0.05, ** q < 0.01, *** q < 0.001.

Demand for development followed a similar but weaker pattern, rising with self-rated physical activity level (r_s = 0.247, q < 0.001), education (r_s = 0.233, q < 0.001) and age (r_s = 0.215, q < 0.001), and falling with household size (r_s = −0.160, q = 0.001).

Institutional and ambassadorial visibility was unrelated to age (r_s = 0.020) and education (r_s = 0.011) and was associated only with self-rated physical activity level (r_s = 0.189, q < 0.001), material situation and quality of life. Perceived quality of the current offer was likewise unrelated to age and education and was associated weakly with quality of life (r_s = 0.149, q = 0.002) and physical activity level (r_s = 0.135, q = 0.005).

The pattern is therefore asymmetric: age and education structure what residents want and value, but not how they judge what the city already provides or how visible its institutions and athletes are. Judgments of the existing offer are structured instead by the respondent's own activity and life satisfaction.

3.6. Differences Between Groups

Sex differentiated none of the four dimensions (Mann–Whitney U, all $p > 0.05$; the largest difference concerned the valuation of science and health, $Z = 1.88$, $p = 0.060$, r = 0.084, women M = 4.25 versus men M = 4.15). At item level, only one of the thirty comparisons survived correction for multiple testing: the degree to which public universities provide access to knowledge and science in physical culture, sport and recreation ($Z = -3.58$, $p < 0.001$, q = 0.012, r = 0.160), with men rating that access higher (M = 3.69) than women (M = 3.46). With 270 women and 230 men the design was powered to detect standardised differences of d ≥ 0.252, so smaller sex differences cannot be excluded.

Kruskal–Wallis comparisons (Table 5) revealed a consistent structure. The valuation of science and health differed by age ($H(3) = 65.20$, $p < 0.001$, $\varepsilon^2 = 0.131$), education ($H(3) = 66.09$, $p < 0.001$, $\varepsilon^2 = 0.132$), marital status ($H(3) = 37.90$, $p < 0.001$, $\varepsilon^2 = 0.076$) and occupational status ($H(3) = 33.44$, $p < 0.001$, $\varepsilon^2 = 0.067$)—the first two of these being the largest effects observed in the study and approaching the conventional threshold for a large effect. Post hoc comparisons showed that respondents aged 15–18 and 19–26 valued this dimension significantly lower than those aged 27–65 and 66 and over, that respondents

with higher education scored above those with primary and secondary education, that single respondents scored below married and divorced respondents, and that non-working respondents scored below working ones.

Table 5. Kruskal–Wallis analysis of variance for the four subscales by respondent characteristics, with effect sizes and Dunn–Bonferroni post hoc comparisons (N = 500).

Grouping Variable	Subscale	H	p	ε^2	Post Hoc Comparisons (Dunn–Bonferroni)
Age group	F1 Perceived quality	8.59	0.035	0.017	19–26 > 27–65 (0.032)
	F2 Demand for development	23.73	<0.001	0.048	15–18 < 27–65 (<0.001); 15–18 < 66+ (0.008); 19–26 < 27–65 (0.007)
	F3 Valuation of science and health	65.20	<0.001	0.131	15–18 < 27–65 (<0.001); 15–18 < 66+ (0.002); 19–26 < 27–65 (<0.001); 19–26 < 66+ (0.025)
	F4 Institutional visibility	6.51	0.089	0.013	—
Education	F1 Perceived quality	5.24	0.155	0.011	—
	F2 Demand for development	27.18	<0.001	0.054	Primary < Higher (0.003); Secondary < Higher (<0.001)
	F3 Valuation of science and health	66.09	<0.001	0.132	Primary < Higher (<0.001); Secondary < Higher (<0.001)
	F4 Institutional visibility	4.77	0.189	0.010	—
Marital status	F1 Perceived quality	11.53	0.009	0.023	Single > Married (0.007)
	F2 Demand for development	19.14	<0.001	0.038	Single < Married (0.023); Single < Divorced (0.002)
	F3 Valuation of science and health	37.90	<0.001	0.076	Single < Married (<0.001); Single < Divorced (0.008)
	F4 Institutional visibility	1.65	0.648	0.003	—
Occupational status	F1 Perceived quality	2.67	0.445	0.005	—
	F2 Demand for development	14.26	0.003	0.029	Not working < Working (0.002)
	F3 Valuation of science and health	33.44	<0.001	0.067	Not working < Working (<0.001)
	F4 Institutional visibility	3.18	0.365	0.006	—

All tests have df = 3. ε^2 = epsilon-squared effect size for the Kruskal–Wallis test, computed as $H/(n-1)$ (0.01 small, 0.06 medium, 0.14 large). Directions in the post hoc column refer to group means.

Demand for development differed by the same four characteristics with small effects (ε^2 = 0.029–0.054), again with the youngest, the least educated, the single and the non-working reporting the lowest demand. Perceived quality of the current offer differed only by marital status (ε^2 = 0.023) and marginally by age (ε^2 = 0.017), with single and younger respondents more satisfied. Institutional and ambassadorial visibility did not differ by any of the four characteristics.

3.7. Multivariable Models

When the nine respondent characteristics were entered simultaneously (Table 6), the picture simplified considerably. Self-rated physical activity level was the only predictor that reached significance in three of the four models: demand for development (β = 0.288, p < 0.001), valuation of science and health (β = 0.174, p < 0.001) and institutional and ambassadorial visibility (β = 0.180, p < 0.001). Education retained an independent association with the valuation of science and health (β = 0.175, p = 0.002), as did male sex negatively (β = −0.224, p = 0.010) and household size negatively (β = −0.094, p = 0.047). Household size also remained negatively associated with demand for development (β = −0.109, p = 0.023). Partnership status was the only significant predictor of perceived

quality of the current offer, and in the negative direction (β = −0.413, p = 0.003), that is, respondents who were or had been in a formal partnership judged the existing offer less favourably.

Table 6. Multiple linear regression of the four subscales on respondent characteristics: standardised coefficients (n = 498).

Predictor	F1 β	F2 β	F3 β	F4 β
Age	0.049	0.056	0.079	0.075
Education	0.085	0.106	0.175 **	0.037
Material situation	0.043	0.038	0.106	0.076
Quality of life	0.105	−0.025	−0.003	−0.002
Physical activity level	0.093	0.288 ***	0.174 ***	0.180 ***
Household size	−0.035	−0.109 *	−0.094 *	−0.052
Male sex	−0.071	−0.070	−0.224 **	−0.038
In employment	−0.117	0.097	0.088	−0.146
Married/divorced/widowed	−0.413 **	0.120	0.113	−0.162
R^2	0.069	0.143	0.167	0.058
Adjusted R^2	0.052	0.128	0.152	0.041
$F(9, 488)$	4.02	9.08	10.89	3.36
Cohen's f^2	0.074	0.167	0.201	0.062

All continuous variables standardised; sex, employment and partnership status entered as dummies (reference: female, not working, single). All models $p < 0.001$. Variance inflation factors ranged from 1.08 to 3.02. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Age lost significance in all four models despite its strong bivariate associations. This is plausibly explained by its collinearity with the other life-stage variables (Spearman r_s = 0.75 with partnership status, 0.62 with education, 0.45 with employment), although all variance inflation factors remained acceptable (1.08–3.02). One plausible reading is that the apparent "age effect" on the valuation of physical-culture science reflects educational attainment and life stage rather than chronological age as such; given the collinearity of these variables and the cross-sectional design, this cannot be tested directly.

The models explained 5.8% to 16.7% of the variance (Cohen's f^2 = 0.062–0.201), all $p < 0.001$. Explanatory power was highest for the two dimensions that express wants (demand for development, R^2 = 0.143; valuation of science and health, R^2 = 0.167) and lowest for the two that express judgments of the city (perceived quality, R^2 = 0.069; institutional visibility, R^2 = 0.058)—suggesting that evaluations of the urban offer are relatively homogeneous across social groups, whereas aspirations are not.

Exploratory extensions of the models did not change this picture substantially (Table S4). Adding interactions of physical activity with age, education and sex increased R^2 by 0.021–0.029 (all $p \leq 0.011$). The only consistent interaction was between physical activity and education (β = −0.100 to −0.168): the associations of activity level with perceived quality, demand for development and institutional visibility were stronger among respondents without higher education (e.g., for institutional visibility, r_s = 0.27 versus 0.10 among those with higher education). After correction for the 12 interaction tests, this interaction remained significant for perceived quality, demand for development and institutional visibility (q = 0.011–0.037), but not for the valuation of science and health (q = 0.137). Entering age and education as categorical variables, or adding the preference for sporting events and the inability to name a city ambassador, increased R^2 by no more than 0.021. Even the extended models left more than 80% of the variance unexplained, which points to contextual determinants not measured here, such as place of residence within the city, proximity to facilities and green space, and actual use of the offer.

3.8. Preferences Regarding Categories of Events

Sporting events were indicated as the most important category of events organised in Katowice by 59.6% of respondents (n = 298), followed by entertainment events (18.0%, n = 90), cultural events (9.0%, n = 45), recreational events (8.2%, n = 41), scientific events (4.4%, n = 22) and other or mixed answers (0.8%, n = 4).

This preference was significantly associated with age ($\chi^2(15) = 42.57$, $p < 0.001$; Monte Carlo $p = 0.001$; Cramér's V = 0.168, bias-corrected 0.136), education ($\chi^2(15) = 47.57$, $p < 0.001$; Monte Carlo $p = 0.006$; V = 0.178, bias-corrected 0.148) and occupational status ($\chi^2(15) = 33.17$, $p = 0.004$; V = 0.149), but not with sex ($\chi^2(5) = 9.73$, $p = 0.083$) or marital status ($\chi^2(15) = 19.30$, $p = 0.201$); all significant associations were weak, and because several expected cell counts fell below five the p-values for age and education were additionally obtained by Monte Carlo simulation with 5000 replicates. The pattern was driven by the youngest and the least educated respondents (Figure 6A): among those aged 15–18 sporting events were named by 35.9% and entertainment events by 34.4%, whereas in every older group sporting events exceeded 58%; among respondents with primary education entertainment events (41.7%) outranked sporting events (38.9%), whereas among those with secondary and higher education sporting events reached 60.2% and 61.6%. Respondents aged 66 and over were distinctive in a different way: 19.4% named recreational events, more than twice the share observed in any other age group.

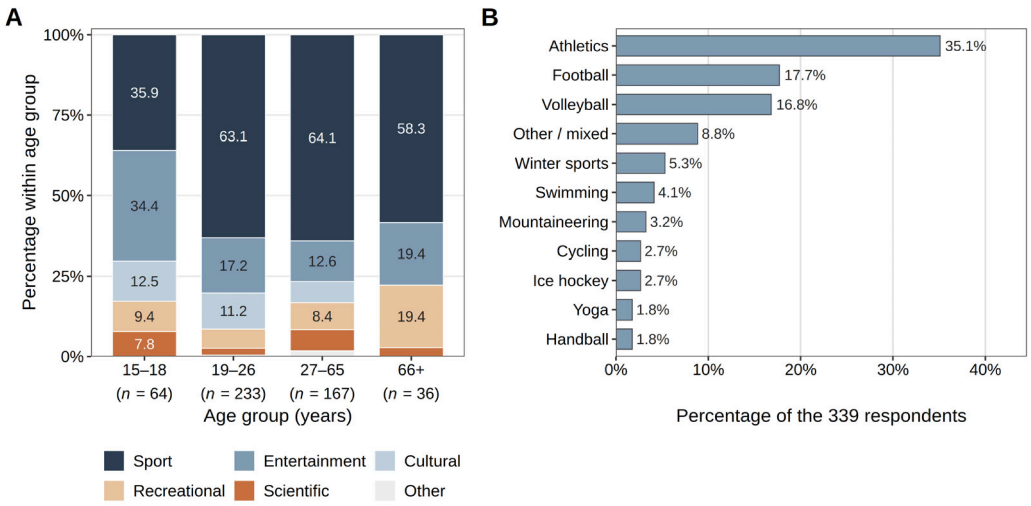


Figure 6. (**A**) Category of events regarded as the most important in Katowice, by age group (N = 500; percentages within age group, values below 7% not labelled). (**B**) Sport disciplines associated with the role of city ambassador, among the 339 respondents who named a person or a discipline; the remaining 161 respondents (32.2%) named no ambassador and are not shown.

In a binary logistic model (Table 7) adjusting simultaneously for age, sex, education and occupational status, age remained the dominant predictor: relative to respondents aged 15–18, the odds of naming sporting events as most important were 3.15 times higher among those aged 19–26 (95% CI [1.43, 6.92], $p = 0.004$) and 3.56 times higher among those aged 27–65 (95% CI [1.36, 9.32], $p = 0.010$). Male sex was independently associated with a higher probability of naming sporting events (OR = 1.53, 95% CI [1.06, 2.23], $p = 0.025$), whereas the crude associations with education and occupational status disappeared after adjustment. The model was significant overall ($\chi^2(10) = 23.85$, $p = 0.008$) but explained little of the variation (McFadden pseudo $R^2 = 0.035$).

Table 7. Binary logistic regression: probability that sporting events are regarded as the most important category of events in Katowice (N = 500).

Predictor	B	SE	OR	95% CI for OR	p
Age 19–26 (ref. 15–18)	1.148	0.402	3.15	[1.43, 6.92]	0.004
Age 27–65 (ref. 15–18)	1.269	0.491	3.56	[1.36, 9.32]	0.010
Age 66+ (ref. 15–18)	1.066	0.754	2.90	[0.66, 12.73]	0.158
Male (ref. female)	0.428	0.191	1.53	[1.06, 2.23]	0.025
Vocational (ref. primary)	0.782	0.999	2.19	[0.31, 15.49]	0.433
Secondary (ref. primary)	−0.163	0.499	0.85	[0.32, 2.26]	0.744
Higher (ref. primary)	−0.294	0.553	0.75	[0.25, 2.20]	0.595
Working (ref. not working)	0.085	0.277	1.09	[0.63, 1.87]	0.759
Disability pensioner (ref. not working)	−0.147	0.786	0.86	[0.19, 4.03]	0.852
Retired (ref. not working)	−0.191	0.711	0.83	[0.21, 3.33]	0.788

Model $\chi^2(10) = 23.85$, $p = 0.008$; McFadden pseudo $R^2 = 0.035$; 500 observations. OR = odds ratio.

3.9. Symbols, Ambassadors and Memorable Events

Answers to the open questions confirm a strongly consolidated, event-based and venue-based city image. Asked which facility is the sporting symbol of Katowice, 73.9% of the 483 respondents who answered named the Spodek arena; the facilities of the Academy of Physical Education followed at 9.9% and the Silesian Stadium at 5.0%.

Asked to name an example of the most important event organised in the city, 440 respondents gave an answer. The Volleyball World Championship was named by 33.4%, IEM Katowice (e-sport) by 12.7%, mass running, cycling and athletics events by 11.8%, other sporting events by 12.7%, concerts and music events by 7.7%, science events including the Silesian Science Festival by 6.4% and handball championships by 2.5%. Sport-related events therefore accounted for 73.2% of all named events.

The question on the person and discipline associated with the role of city ambassador produced the most revealing distribution. Almost a third of respondents—161 of 500 (32.2%)—explicitly answered that they did not associate the role with anybody. Among the 339 respondents who did name a person or a discipline, athletics dominated (35.1%), followed by football (17.7%), volleyball (16.8%), winter sports (5.3%), swimming (4.1%), mountaineering (3.2%), cycling and ice hockey (2.7% each), and yoga and handball (1.8% each) (Figure 6B). The combination of a high proportion of "none" answers with the low mean recognisability of "People of Sport" (M = 3.21, the lowest mean in the questionnaire) suggests that the ambassadorial function is the weakest element of the city's sport-related identity.

3.10. Qualitative Findings

The percentages reported in this section are descriptive summaries of the views expressed in the interviewed groups (residents, n = 73; sector organisations, n = 16; athletes, n = 41), calculated among the participants of each strand who addressed the given question; they are not population estimates.

3.10.1. Residents and Persons Linked with the City and the Region

Asked which institution in Katowice delivers the mission of physical culture, sport and recreation by instilling passion and inspiring the local community, residents named eleven different institutions. The Academy of Physical Education in Katowice was indicated most frequently (60% of participants), who judged that it performs this mission "very well" through "promoting and organising sporting events, including cycling rallies and cross-country runs", "substantive support for the programming of the development of sport and recreation in the city and the region", "co-organising sporting events at the Silesian Stadium", "initiating and organising physical activity classes for the local community",

"offering specialisations and study programmes referring directly to a healthy lifestyle and the promotion of physical activity", and "organising sport and recreation events for the student community".

Participants described the role of athletes associated with Katowice in terms of representation, education and motivation: athletes "are examples for others and ambassadors of sport, together with their clubs and their diagnostic and scientific facilities", "show a different face of the city of Katowice", "promote the city in international arenas", "promote health and universal physical activity", and "show that everyone can achieve a great deal through hard work, motivating young people". Participants also pointed to the need to regulate formally the way in which athletes are engaged in city promotion, arguing that this would produce both image-related and social benefits, including the popularisation of niche disciplines.

3.10.2. Sector Organisations

Representatives of organisations operating in physical culture, sport and recreation named eight institutions delivering the mission; the Academy of Physical Education was again the most frequently indicated (60%), described as the leader by virtue of its staff, infrastructure and scientific and teaching base, and specifically through "the education of professional staff in physical culture, sport and recreation", "promoting and initiating sport and recreation events for different age groups", "the integration of the sporting community through cooperation with sport clubs, associations and other organisations", "treatment through movement", "conducting scientific research in the area of physical culture and sport" and "environmental, intergenerational and geographical integration in the field of sport". The City Hall of Katowice, the Spodek arena and the Silesian Stadium followed (40%), credited above all with "effective management of sport infrastructure supported by an analysis of residents' needs in public consultations".

All representatives of sector organisations (100%) described permanent societal care for health well-being, including participation in prevention programmes, as being of "very great importance". Their arguments linked demography and public finance: "the increase in average life expectancy and the need to maintain health mean that the number of people interested in maintaining high physical and mental fitness throughout life is growing"; prevention programmes matter "in the era of numerous civilisation diseases as factors improving physical and mental health and reducing the cost of medical care in the future". They also identified a governance need: "there is a great need to tighten cooperation between organisations operating in the area of physical culture, sport and recreation and the City Hall in order to develop and implement strategic programmes".

The significance of the city's sport and recreation infrastructure for the local community was assessed as "very great" by 80% of the representatives and as "great", "particular" or "significant" by the remaining 20%. The arguments emphasised diversity of use ("appropriate infrastructure allows a differentiated approach to sport and recreation, both indoor and outdoor, professionally and as amateurs"), the threshold function of infrastructure ("appropriate infrastructure is a base for activity already undertaken, or may become a reason to encourage those not yet convinced"), accessibility for people with disabilities, and the role of free, publicly available facilities in enabling regular activity. All representatives (100%) considered the city's potential for developing that infrastructure to be "great", pointing to the obligations of local government, the need to develop teaching and research infrastructure for sport, the location advantages of the city within the conurbation, the demand for facilities for urban sports (skateparks, pump tracks, roller and cycling routes, bike parks, ice rinks) and the potential of the city's forests, parks and squares, in which scheduled classes with professional coaching staff could be offered. The city's capacity

to organise events in physical culture, sport and recreation was rated as "very great" or "great" by 95% of the representatives, who pointed to the material potential for large events, ongoing investment, experienced sport-management staff and effective promotion through events of local, national and international rank. Their principal recommendation was to make stronger use of the scientific base of the Academy of Physical Education and of the experience of the region's multi-section clubs in identifying the needs of spectators and sport stakeholders.

The role of athletes associated with Katowice was rated as of "great importance" by 75% of the representatives, of "medium importance" by 8% and of "small importance" by 16%. Athletes were described as "a magnet attracting a large number of spectators", as motivators and as "authorities and mentors, in particular for young people", whose results also "influence the prestige of the university and of the clubs in which they train". The representatives concluded that the existing possibilities in this respect are not fully exploited and that systematic material and organisational support is required.

3.10.3. First-Class and Master-Class Athletes

Athletes assessed their own role in the promotion of the city, the region, science, physical culture, sport and recreation as "very great" (90%), manifested in "promoting the city of Katowice nationally and worldwide through high sport results", "promoting the Katowice sport clubs, the university and the schools in which they began their sporting careers", "inspiring and building healthy habits of physical activity in the community", "teaching how to live healthily throughout life" and "broadening people's awareness, particularly among young people, of the dual career, that is, how to reconcile study with sport".

Asked what athletes should do for the promotion of the city and of science, respondents indicated worthy representation of the city, the university and the clubs from which they originate; participation in meetings with children in kindergartens, schools and family picnics, where they would talk about their careers, inspiring young people to take up sport and teaching self-confidence; and sharing their knowledge and experience in health-oriented training. Asked what they already do, they most frequently indicated representing Katowice and the AZS Katowice club in national and international arenas, creating a positive image of the city, the university and the club, participating in programmes and events not only as competitors but also as invited guests and spectators, and using social media to share the profiles of the city, the club and the university.

Their proposals for the future concentrated on three ideas: organised events, meet-ups, workshops and sport festivals bringing athletes and coaches together with residents and supporters in a space dedicated to such meetings; presentations by athletes on the ministerial and university programmes that enable a dual career, such as the National Academic Team and the Individual Programme and Plan of Studies; and the systematic use of promotional materials of the city and the region during national and international competitions. These proposals converged on a single infrastructural postulate: the creation of an "interactive centre of sport", combining a museum with a modern sport park and using digital technologies to engage the community with the sporting heritage, achievements, research and innovation of the region.

4. Discussion

Rather than restating the results, this section considers what they imply conceptually and for policy. Five observations frame the discussion: the institutional attribution of the mission of physical culture to the Academy was consistent across both strands; the value residents attach to physical-culture science and health exceeded their evaluation of current

provision; the demand profile was headed by recreational green areas rather than by built facilities; after mutual adjustment, expectations were associated more consistently with self-rated physical activity than with demographic characteristics; and the ambassadorial function appeared to be the weakest element of the city's sport-related identity. Because the survey sample was not representative and the design was cross-sectional, these observations describe patterns within a broad local sample, and the interpretations offered below are hypotheses rather than established causal explanations.

4.1. Integration of Quantitative and Qualitative Findings

Table 8 juxtaposes the principal survey findings with the corresponding qualitative material. The two strands converged on the institutional attribution of the mission of physical culture, on the priority of health and prevention and on the strength of the city's events. The qualitative material extended the survey findings by specifying what kind of infrastructure development participants had in mind (programmed and staffed use of green space, facilities for urban sports) and by adding accessibility for people with disabilities, which the questionnaire did not measure. The strands diverged on the ambassadorial function: whereas 32.2% of survey respondents could name no sporting ambassador and the recognisability item had the lowest mean in the questionnaire, athletes described their own promotional role as very great and proposed concrete forms of engagement. The survey result thus documents low public recognition, while the focus-group proposals describe a willingness and a repertoire of activities that are not yet visible to residents; the two should not be conflated, and the gap between them is discussed in Section 4.2.

Table 8. Joint display of the principal quantitative and qualitative findings.

Domain	Survey (Quantitative Strand)	Focus Groups (Qualitative Strand)	Integration	Meta-Inference
Institutional attribution	95.0% named the Academy of Physical Education as best qualified to deliver the mission; 93.6% as the most inspiring university	Academy most frequently named by residents and by sector organisations (60% in each strand), owing to its staff, infrastructure, research and events; City Hall, Spodek and Silesian Stadium also named (40%)	Convergent	The mission is clearly attributed; the qualitative strand adds the reasons and complementary municipal actors
Health and prevention	Valuation of science and health was the highest-rated dimension (M = 4.20); 90.0% rated care for healthy ageing as important; 35.2% were satisfied with health-promoting classes	All sector representatives (100%) rated permanent care for health as of very great importance, citing longevity, civilisation diseases and future costs of care; closer cooperation between the city and sector organisations requested	Convergent; complementary	High priority confirmed; the qualitative strand supplies the rationale and a governance proposal for the weakly rated offer
Infrastructure and green areas	Facilities met the expectations of 46.4–46.8% and green areas of 58.4%; need for development of green areas 71.0%	Infrastructure of very great significance (80%); development potential great (100%); demand for urban-sport facilities and for scheduled, coached classes in forests and parks	Convergent; expanding	The qualitative strand specifies the type of development: programmed and staffed use of green space
Events	Sporting events most important for 59.6%; 75.6% saw sport events as raising tourist attractiveness	Capacity to organise events very great or great (95%); recommendation to use the Academy's scientific base and the clubs' experience to identify spectators' needs	Convergent	Events are a recognised strength; evidence-based event planning suggested
Athletes as ambassadors	32.2% named no sporting ambassador; recognisability of "People of Sport" had the lowest mean (M = 3.21)	Athletes rated their own promotional role as very great (90%); sector organisations rated it as important (75%) but "not fully exploited"; proposals for meetings, dual-career presentations and an interactive centre of sport	Divergent	Athletes' willingness and repertoire contrast with low public recognition; missing institutional mechanisms are a hypothesis for further research

Table 8. *Cont.*

Domain	Survey (Quantitative Strand)	Focus Groups (Qualitative Strand)	Integration	Meta-Inference
Accessibility	Not measured	Accessibility for people with disabilities named as a criterion of infrastructure quality	Qualitative only	Gap in the survey instrument, to be addressed in future surveys

Survey percentages refer to $N = 500$. Focus-group percentages are descriptive summaries of the views expressed in the interviewed strands (residents, $n = 73$; sector organisations, $n = 16$; athletes, $n = 41$) and are not population estimates. Convergent, both strands point in the same direction; complementary or expanding, one strand adds information not captured by the other; divergent, the strands point in different directions.

4.2. The Dimensional Structure of Residents' Expectations

The main methodological observation of this study is that residents' expectations towards physical culture in a city did not form a single evaluative continuum. Satisfaction with the existing offer and the value attached to physical-culture science correlated only weakly ($r_s = 0.29$), and the two dimensions had different social profiles: the valuation of science and health rose steeply with education and age ($\varepsilon^2 = 0.132$ and 0.131, the largest effects in the study), whereas judgments of the existing offer were essentially flat across those characteristics. In practical terms, a city may not be able to infer demand for health-oriented science programmes from satisfaction surveys about facilities, or satisfaction from expressed enthusiasm for health, and the two should therefore be measured separately. The four subscales reported here are internally consistent ($\alpha = 0.85$–0.90, $\omega = 0.89$–0.92), but their structure is exploratory and derived from a single sample, and confirmatory testing is needed before they can be used as a validated instrument.

This also refines a recurrent claim in the residents' perception literature, where support for sport provision is usually treated as a single latent construct predicted by perceived benefits [30,33]. In the present data, perceived benefits (the tourism and interest items) loaded with institutional and ambassadorial visibility rather than with satisfaction, suggesting that "benefit perception" in a host city is partly a judgment about who delivers sport, not only about what sport delivers.

The four dimensions can also be read conceptually. From the perspective of participatory and collaborative planning [86,87], they correspond to different positions that residents occupy in urban governance: users who evaluate a service (F1), claimants who articulate demand (F2), a public that attributes value to expert knowledge (F3), and an audience that judges the visibility and legitimacy of the institutions and figures that represent the city (F4). Needs assessments that record only the first two positions treat residents as consumers of provision; the third and fourth show that residents also form judgments about who should hold and communicate knowledge, which is the ground on which co-production, rather than consultation alone, can be built. From the perspective of socio-ecological transitions [57,88], the combination of a high valuation of physical-culture science and health with a lower rating of current provision can be read as a tension between normative expectations and existing institutional routines. Transition research treats such tensions as potential levers for change when intermediary organisations take them up; in Katowice, the university with a physical-culture mandate is positioned to act as such an intermediary between municipal planning, sport organisations and residents. These readings are interpretive and indicate how the dimensions might be used in governance research; they do not establish causal mechanisms.

That recreational areas—parks, squares, forests and meadows—attracted both the highest satisfaction (58.4%) and the highest declared need (71.0%) is consistent with a large body of international evidence. Meta-analytic work shows that green and blue

physical activity improves quality of life [12], population studies link green-space access with leisure-time activity and with mental and physical health outcomes [13–16], and intervention syntheses indicate that the health and equity effects of green space depend on design and participation rather than on area alone [11]. The Katowice result adds a policy-relevant nuance: within the demand dimension, the two green-space items were the ones most strongly related to age and education (r_s = 0.24–0.29, against 0.09–0.19 for the remaining needs items), that is, to precisely the groups for whom green space is the most feasible activity setting across chronic-disease status [23,24]. The evidence that quality and equitable distribution matter more than aggregate quantity [17,20,21] argues against a simple expansion of green area in favour of qualitative upgrading—lighting, surfaces, year-round programming, staffing—which is also what the sector organisations proposed when they asked for "scheduled classes with professional coaching staff" in the city's forests and parks. In a conurbation whose green resources are frequently post-industrial reclamation land, the longitudinal finding that urban green space changes substantially as cities grow [22] is a further argument for protecting these assets in planning documents rather than treating them as residual space. Beyond their recreational function, parks, forests and meadows are elements of green infrastructure that provide ecosystem services, such as heat and water regulation, habitat provision and restorative environments, and contribute to urban resilience [27,88,89]. Residents' demand for their use and development is therefore not only a sports-policy input but also an argument within ecosystem-based territorial planning, in which ecosystem assessments inform land-use decisions and the protection of ecologically valuable areas [90]. In a post-industrial city, aligning recreational demand with ecological protection criteria can help to prevent recreational intensification from degrading the ecosystems that make these areas attractive in the first place.

The most pronounced contrast concerned health-promoting classes: only 35.2% of respondents found the existing offer satisfactory, the lowest share of positive answers for any item, whereas 80.6–90.0% rated health-related knowledge and healthy ageing as important (Figure 3). Because these indicators differ in wording and construct and the questionnaire contained no matching development item, the contrast does not quantify unmet demand; it suggests a possible mismatch between the priority residents attach to health and the offer they perceive, which a future survey with directly paired items should test. Such a mismatch would be consistent with the Polish evidence that leisure-time activity participation has grown only slowly and unevenly [44] and that local-government spending on physical activity promotion has been imperfectly aligned with residents' opinions [46]. It would also be consistent with the wider observation that sport policy systems tend to allocate attention to elite "podium" outcomes at the expense of participation [41,42], a tension that remains visible in the centralised Polish system [45] and in comparable Central and Eastern European settings [47]. If confirmed, the implication for a science-city programme would be that the scarce resource is not enthusiasm but programmed, staffed and continuous provision.

Residents evaluated events more favourably than facilities, attributed to them effects on activity and tourism, and held an event- and venue-based image of the city's sport (Sections 3.3 and 3.9). This is consistent with reviews showing that residents' support for events is grounded in perceived social and quality-of-life benefits [30,33] and with recent evidence that perceptions of major events are associated with residents' own sport participation behaviour [34]. It is also consistent with the place-branding literature that treats residents as an internal brand constituency whose pride and sense of place mediate the acceptance of a city's image strategy [37–40], and with work on small-scale events as branding platforms in their own right [32,36].

By contrast, the ambassadorial function appeared weak. Almost a third of respondents (32.2%) could not name any sporting ambassador of the city, the recognisability item had the lowest mean in the questionnaire (M = 3.21), and the two ambassador items attracted the highest shares of negative ratings. The qualitative material suggests a possible explanation for this asymmetry (Table 8): athletes reported very high self-assessed engagement (90% "very great role") and a concrete repertoire of activities, sector organisations rated their importance as great (75%) but stated that the existing possibilities are "not fully exploited", and residents called for the formal regulation of how athletes are engaged in city promotion. The bottleneck may therefore be institutional rather than motivational—an absence of transparent procedures, funding and dedicated venues linking willing athletes to a receptive public. This reading is consistent with the leverage perspective in the event literature, which holds that social outcomes must be engineered around an event rather than expected from it [28,29], with systematic evidence that place branding through sport events works through governed, repeated mechanisms rather than through visibility alone [31], and with findings that legacy outcomes such as volunteering require deliberate programme design [35]. The disciplinary distribution of named ambassadors—athletics 35.1%, football 17.7%, volleyball 16.8%—may further indicate that recognition attaches to individual careers rather than to the city, since the disciplines named do not correspond to the events residents remember, which were dominated by volleyball.

The multivariable models add nuance to the equity argument. In bivariate terms, expectations rose with age, education, material situation, quality of life and physical activity, and fell with household size—a pattern that would suggest the constituency for a science-based physical-culture programme is the more advantaged part of the population. After mutual adjustment, however, only two predictors survived consistently: self-rated physical activity level, significant in three of the four dimensions, and education, significant for the valuation of science and health. Age lost significance everywhere, its association apparently being absorbed by education and life stage.

Two interpretations follow, both of which should be treated as hypotheses. First, within this sample, differences in expectations were associated more closely with self-rated physical activity than with demographic characteristics. If this pattern is confirmed with validated activity measures and longitudinal data, it would imply that less active residents express weaker demand, so that consultation-based planning could under-represent them—the outcome that participatory-planning research warns about when engagement geographies are uneven [49]. Given the cross-sectional, self-reported design and the modest explained variance (R^2 = 0.058–0.167), the present data do not show that activity level causes these differences. The exploratory interaction between physical activity and education (Section 3.7) points in the same direction: activity level differentiated expectations most among respondents without higher education. Second, the groups whose expectations were lowest—respondents aged 15–18, those with primary education, those not working, those in larger households—differed qualitatively and not merely quantitatively in what they wanted: adolescents and the least educated ranked entertainment events as highly as sporting events (34.4% and 41.7%), and the oldest respondents ranked recreational events unusually highly (19.4%). Reaching them may therefore require hybrid formats—the "mixed events" with professionals and amateurs that residents themselves postulated—and, in the case of adolescents, formats designed for that age group rather than an extension of adult provision [91].

The near-absence of sex differences is itself informative. Only one of thirty items differed after correction—the perceived access to knowledge and science in physical culture provided by public universities, rated higher by men—while in the adjusted model men scored lower on the valuation of science and health. If the perception of access to

sport-science knowledge is asymmetric while the valuation of that knowledge is not, the asymmetry is more plausibly located in communication channels than in the content of provision, which is consistent with science-communication research showing that citizens' pathways to knowledge are plural and institutionally mediated [50].

Accessibility for people with disabilities emerged in the qualitative strand as an explicit criterion of infrastructure quality, but was not measured quantitatively. This is a substantive limitation, because the international evidence indicates that the accessibility information attached to a facility is itself a determinant of use [51] and that, for people with disabilities, the quality of participation predicts subjective well-being more strongly than its quantity [52,53]. A science-city programme that treats the sciences of physical culture as an expert resource is well placed to close this gap by standardising accessibility audits and accessibility information for municipal facilities.

4.3. Implications for Sustainable Urban Policy

The five pillars derived from the data align the results with the Healthy Cities and Health in All Policies frameworks [8–10], with the population-level evidence that city planning is a determinant of physical activity and health [6,7], and with the urban-design evidence on activity-supportive environments [18–20,92,93]. These implications are specific to Katowice and derive from a single-city, cross-sectional, non-probability study; they are offered as hypotheses to guide local planning rather than as tested interventions. Four implications are worth stating explicitly. First, the university with a physical-culture mandate should be treated as an expert node in urban governance—in the design and evaluation of municipal space, in the certification of staff and in health-oriented programming—and not merely as a provider of events; this is the applied form of the university's "third mission" [48] and of the science-as-new-industry logic on which the European City of Science programme was built [56]. Second, provision should shift from campaign-based to permanent staffing, since the deficit identified by residents concerned continuity of offer rather than one-off opportunity. Third, because expectations in this sample were associated more closely with activity level than with demographic characteristics, outreach could be targeted behaviourally: programmes for the inactive are unlikely to be well designed from the expressed preferences of the active alone. Fourth, the interactive centre of sport proposed by athletes and sector organisations is, in the language of this literature, a legacy asset: a permanent venue that converts the city's event-based image capital and its post-industrial heritage [54,55] into a year-round instrument of health promotion and science communication, and one that directly addresses the ambassadorial deficit by giving athletes a place to meet residents.

A critical caveat applies to these implications. Programmes that brand a city as a city of science or knowledge and that mobilise sport events for place promotion are part of the entrepreneurial turn in urban governance [94]. Research on creative- and knowledge-city strategies has shown that such programmes may privilege already mobile, educated and digitally active groups [95], that citizen participation within them often remains consultative or tokenistic [86,96], and that event-led planning tends to overpromise and to divert resources from everyday provision [97]. The composition of the present sample, which was young, educated and physically active, illustrates the risk: the voices most easily captured by science-city consultations are those of residents who already participate. Using physical-culture science mainly as an instrument of urban branding, without permanent and accessible provision for less active, older and less educated residents, would reproduce the selective participation that such programmes claim to overcome. The five pillars should therefore be understood as conditional on inclusive delivery rather than as branding assets.

4.4. Relevance for Other Post-Industrial Cities

The Katowice case does not permit statistical generalisation, but it can support analytical generalisation, that is, the formulation of propositions that can be tested in other settings [98]. It is most relevant to European cities undergoing comparable post-industrial transitions, such as the former coal and steel cities of the Ruhr or the Ostrava agglomeration, in which brownfield reclamation, event-led repositioning and the third mission of universities intersect [48,54,55]. Three conditions are likely to shape whether the lessons transfer: (i) the presence of a university or research institution with an explicit physical-culture or health mandate that can act as an intermediary between municipal planning and residents; (ii) the availability of reclaimed green and post-industrial land that can be programmed for recreation without compromising its ecological value; and (iii) a city-branding strategy that uses events and science, which creates both an opportunity to engage residents and the risk of selective participation discussed above. Whether the four dimensions and the five pillars hold under these conditions is an empirical question. The questionnaire provided in Supplementary File S1 is offered to facilitate such comparative testing, not as a validated instrument.

4.5. Limitations

Several limitations must be acknowledged. First, the sampling was quota-free and combined face-to-face and on-line administration; although the realised sample exceeded the minimum required for a 95% confidence level and a 5% maximum error, it was not a probability sample, and respondents aged 19–26 (46.6%) and those with secondary or higher education (91.0%) are over-represented relative to the city's population structure, while respondents aged 66 and over (7.2%) are under-represented. Results should therefore be read as the structure of expectations within a broad and diverse sample rather than as unbiased population estimates, and the group differences reported for older respondents rest on 36 cases. In addition, residence status and the mode of completion were not recorded at case level, so residents and functionally linked respondents could not be compared and mode effects could not be tested; the recruitment channels are likely to have favoured young, educated and physically active respondents (Section 2). Second, the test of independence in the 4×6 contingency tables was powered only for $w \geq 0.194$, and several expected cell counts fell below five; Monte Carlo *p*-values were used, but the categorical analyses remain the least robust part of the study. Third, all measures were self-reported and, in the case of physical activity level and quality of life, single-item, which limits precision; the physical activity measure in particular is a subjective global rating and not a validated instrument, so the finding that activity level is associated with expectations requires replication with objective or validated measurement. Fourth, the design was cross-sectional, so no causal inference is warranted, and the explained variance in the multivariable models was modest ($R^2 = 0.058$–0.167), leaving most of the variation in expectations unaccounted for. Fifth, the free-text answers were coded by a keyword-based scheme applied by a single coder, so no inter-rater reliability could be computed. Sixth, the questionnaire was developed ad hoc for this needs assessment, and its component structure was established by exploratory principal component analysis in a single sample. Although the polychoric-based sensitivity analysis reproduced the allocation of 29 of the 30 items, the number of common factors was not unequivocal, the structure has not been cross-validated, and measurement invariance and test–retest stability have not been examined; internal consistency does not establish construct validity. Seventh, the study was conducted in a single city in November 2022, in a period still marked by the post-pandemic recovery of sport participation, and by the Volleyball World Championship hosted in Katowice two months earlier, which plausibly inflated the salience of that event in the open answers. Eighth, the fieldwork was conducted

by the Academy of Physical Education, which was also one of the institutions evaluated in the institutional questions. Although these questions listed all the public universities of the city, the involvement of Academy interviewers and recruitment channels may have favoured the Academy in the institutional attribution (95.0%) and contributed to the over-representation of respondents aged 19–26; these results should be interpreted with this in mind. Ninth, 19 respondents (3.8%) gave invariant answers to all ordinal items; excluding them did not change the component structure or the main associations, but some small effects, such as those of household size in the adjusted models, were no longer significant (Table S3). Finally, the qualitative strand reports proportions of participants endorsing given views; these are descriptive of the interviewed groups and are not intended as population estimates.

4.6. Directions for Further Research

Six lines of work follow directly. First, a post-2024 replication with the same questionnaire would allow the expectations recorded here to be compared with the perceived delivery of the European City of Science programme, turning a needs assessment into a legacy evaluation of the kind advocated in the event literature [28,35,36]. Second, confirmatory factor analysis with estimators appropriate for ordinal data in an independent sample, together with tests of measurement invariance across age and education groups, would establish whether the structure reported here is stable—a precondition for using it as a monitoring tool. Third, objective measurement of physical activity and geolocated measurement of green-space and facility exposure would permit the self-reported associations found here to be tested against behaviour, following the methods used in the built-environment literature [6,16–20]. Fourth, dedicated research on the ambassadorial mechanism—which athletes, which formats and which audiences actually change participation—would address the single largest gap between recognised potential and realised effect identified by this study. Fifth, future surveys should include directly paired supply and demand items for health-promoting provision, record residence status and mode of completion, and use probability-based or calibrated sampling where population estimates are required. Sixth, contextual variables, such as the district of residence, the distance to facilities and green space and the actual use of the offer, would help to explain the variance left unexplained by individual characteristics, and comparative studies in other post-industrial cities would test the conditions of transferability outlined in Section 4.4.

5. Conclusions

This study shows that residents of Katowice and people functionally linked with the city regard the sciences of physical culture as a resource of urban transformation in their own right. Health- and knowledge-related expectations were valued more highly than the current offer, and the Academy of Physical Education was almost unanimously identified as the institution responsible for the mission of physical culture. Expectations were organised into four exploratory dimensions, namely the perceived quality of the current offer, demand for development, the valuation of physical-culture science and health, and institutional and ambassadorial visibility, with the strongest demand directed at recreational green areas and the ambassadorial function of the city's athletes appearing to be the weakest element.

Within this non-probability sample, expectations were associated more consistently with self-rated physical activity than with demographic characteristics after mutual adjustment, although the models explained only a small part of the variance. This pattern suggests, but does not demonstrate, that consultation relying on expressed demand may under-represent less active residents.

For Katowice, the findings translate into five context-specific programme pillars: a healthy development paradigm, sustainable urban space, the scientific environment as an expert resource, health-promoting infrastructure including an interactive centre of sport, and a differentiated event portfolio. For other European cities undergoing post-industrial transition, the case suggests three lessons to be tested rather than a ready-made template: residents distinguish between satisfaction with provision and the value they attach to health-related knowledge, so both need to be monitored; reclaimed green and post-industrial spaces are central to residents' demand and should be planned as green infrastructure; and science-city and event-led strategies need permanent and inclusive delivery mechanisms if they are not to privilege already active groups.

Future work should test the four-dimensional structure confirmatory in independent and comparative samples, record residential and spatial context, use directly paired supply and demand items and validated activity measures, and evaluate after 2024 whether the European City of Science programme changed residents' perceptions, turning this needs assessment into a legacy evaluation.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su182110860/s1, File S1: Questionnaire (original Polish version and English translation); Table S1: Sensitivity analysis using exploratory factor analysis of the polychoric correlation matrix (minimum-residual extraction, oblimin rotation, N = 500, 30 items); Table S2: Results under alternative assignments of the item "Health-promoting classes meet expectations" (N = 500); Table S3: Results after exclusion of respondents who gave identical answers to all 30 ordinal items (straight-lining, n = 19); Table S4: Extended regression models (n = 498) with interactions of physical activity with age, education and sex, categorical coding of age and education, and additional respondent-level variables.

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Institutional Review Board Statement: Ethical review and approval were waived for this study as per the guidelines issued by the National Science Centre, Poland (Narodowe Centrum Nauki, NCN; Guidelines for Applicants to Complete the Ethics Issues Form in the Proposal, December 2021; available online: https://www.ncn.gov.pl/sites/default/files/pliki/regulaminy/2021_12_wytyczne_dla_wnioskodawcow_kwestie_etyczne_ang.pdf (accessed on 11 October 2026), because the study involved only the retrospective analysis of existing, anonymised secondary data made available under a municipal commission. The original data collection was an anonymous, non-interventional opinion survey with focus-group interviews that collected no health or other sensitive personal data. The study was conducted in accordance with the Declaration of Helsinki.

Informed Consent Statement: Informed consent for participation was obtained from all subjects involved in the study.

Data Availability Statement: The aggregate data supporting the reported results are contained within the article. The de-identified item-level dataset and the R script used to generate Figures 2–6 and the sensitivity analyses are available from the corresponding author on reasonable request.

Restrictions apply to the availability of the raw individual-level data, which were generated for the commissioning institution.

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