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The Relationship Between Children, Sports And Ergonomy In The Architectural Design Process

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ABSTRACT

Childhood period refers to the years during which the child develops the most quickly and efficiently, and sets the most interaction with the environment. It is essential to provide an education in a way that fulfills the child's individual characteristics and needs in this period. Based upon the necessity to raise awareness for doing sports during childhood, the significance of the place to do sports is also regarded to play a big part in developing this awareness. The places, where children perform any physical and mental activities, must be in compliance with them. The arrangements providing compliance are also defined as ergonomic arrangements. In this regard, a literature review, from general to specific, was conducted, and a model of child and sports relationship based on ergonomic factors affecting physical formation was developed in the context of the study. With the developed model, the relationship between child and sports in the architectural design process for children's sports facilities were introduced; the ergonomic arrangements for children were determined; and the factors affecting the design of children's sports facilities and the essential principles were set forth.

Key Words*: Sports, Child, Space, Ergonomics, Child Sport Complex.*

1. INTRODUCTION

It has been known for many years that sport activities play an essential role in the basis of any sort of physical and social development (Cote et al., 2007) . The human organism has been created for movement and it has been organized in line with movement. Different researchers have shown that this development occurs most importantly during the period of childhood, it can be claimed that awareness of this has not reached the sufficient level in Turkey yet if we consider the achievements on both the national and international sports fields (Sunay, 1998).

In this regard, the government should also strengthen and spread sports facts and take relevent measures related to this topic. It is substantially important to make sport activities, which are practised by different game organizations with different rules, available to all sectors of society (Sunay & Tuncel, 1999). In this extent, both olympic and nonolympic 37 sport fields in Turkey maintain its activities by completing the organization of the federation.

When we analyse the sport politics of developed countries, we realise that the starting age of sports activities and physical education has decreased (Ertaş,

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2012). Today, most of the countries sport fields are seen to be very supportive of children who tend to do sports, by solving almost all the problems related to the sports field and providing them with different sport programmes that match with their physical and physiological needs (Coalter, 2010). And this leads children to have a proper sports environment and to get the desired achievement. Therefore, in order to make the sports field in Turkey more of an economic activity other than a service industry, all civil and private institutions should strengthen accountrements and beside they should support the awareness of sports at a young age with their activities. Thus, In Turkey sports field may get an efficient position by achieving in different fields of activities. In the 1980's, after it was recognized that gravitating towards sports at a young age is important, systems constructed at this purpose have arisen and have taken place in literature as the "child sport complex" . In Turkey, concepts like child and sport have arisen in the 2000's with reliable programmes. These kind of sport facilities should be designed to help children to have a reliable education according to their ages and help to grow sportsmen who will be able to represent their countries both nationally and internationally (Ertaş, 2012).

In Turkey and in the world, the fact that sport has become an industry that inspires economy has suggested the importance of the relationship between children and sport. All society members have agreed with the idea that requirements of sport environments are very important to familiarize children with sports and develop their abilities until they become healthy adults. For this purpose, there should be available platforms presented to be reliable and encouraging to sports in order to make children grow up to be sportsmen. Since therefore, a model from an individual to a child, based on ergonomic factors in the purpose of executing circumstances that may be faced in the process of "Architectural Design" of sport environments in which a literature study from the general to the specific for the concepts of sport, ergonomy and child has been developed. The major unit in this model is the individual. The activity which is done by the individual is the sport and the spaces in which the activities take place and organizing these spaces have been described as an ergonomic regulation (Figure 1).

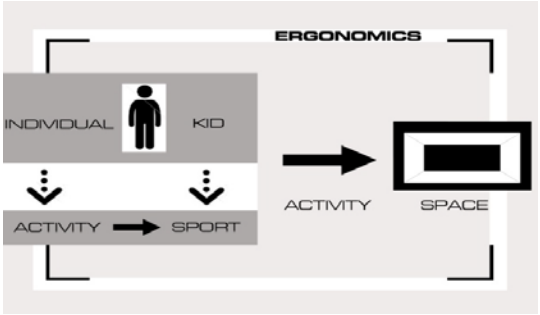

Figure 1. The relationship between the child, sport and ergonomy (Ertaş, 2012).

Thus, "Design Process Model" has been constituted with required principles addressed and factors which effect the child's sport complex by ergonomic regulations for children and sports relationship.

2. METHODS

2.1. The Model of Architectural Design Process

Childconsists of the basis of "Architectural Design Process" for child sport complex. The concept of child; consists of alternatives for solving problems related to sport, ergonomy and designs. That's why, it has been aimed to design a model which also includes different disciplines that are effective in the design process. It has benefited from the transparent box process, which is Aksoy's architectural design process, during building up the main fiction of the model. In the approach to the transparent box; the things in the designer's mind are tried and tested using psychological research. The transparent box is attributed to rational principles rather than mystic acceptances. In this case, the design process is quite explainable.

The Aksoy architectural design process gathers under the titles of defining a problem, collecting information, analysis, setting a target, synthesis, evaluating, developing and the ultimate design product (Aksoy, 1987), (Figure 2).

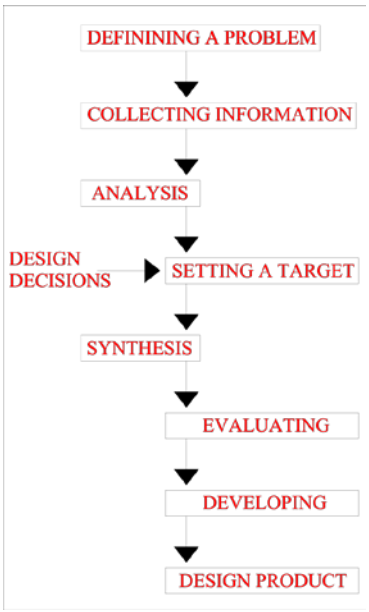

Figure 2. The model of the design process (transparent box), (Aksoy, 1987).

In order to make these transactions occur, there are four rules that need to be followed (Aksoy, 1987). These rules are listed below as:

1. Not adopting anything of which accuracy is not clear.
2. Separating the subject to be analysed in to sections in order to resolve it easier.

3. Reaching the information of compounds step by step, by starting from the plainest and easiest things.
4. Counting and repeating in order to be sure that there are no missing points.

Just like the stage in the 3rd rule "Reaching the information of compounds step by step, by starting from the plainest and easiest things" , the most detailed information related to concepts of sport, children and ergonomy and needs to be known in the design of a child sport complex is analysed, the flow charts which presents interactions with their places in the design process model by addressing the factors which affect the design process model and their relations between each other. Thus, depending on Aksoy's architectural design process model, it has been targeted to present factors which affect ergonomy upon child/sport relationship, principles and inputs.

2.2. Architectural Design Process in Child Sport Complex

Design is a concept that requires a very disciplined complex. That's why the design process should also adopt different disciplines which include multiple thinking. In Aksoy's transparent box process and sport, the child and ergonomy concepts are evaluated one by one in order to collect these inputs. A "Design Process Model" has been formed and a flow chart in which relationships between concepts and their compounds are summarized under each title, and the position and interactions of these factors in the design process model are specified.

2.2.1. The Sport Concept

Sport is an international culture and a tool which includes a lot of people from different cultures. It is a versatile, comprehensive and varied concept. Sports science also includes mental development as well as it's effect on physical development. Sport affects improvement of all people from different age groups from childhood, youth, adulthood through to old age. These phases are separated by many scientists to the age groups mentioned below, according to their improvement features (Meinel & Schnabal, 1977; Kale &Erşen, 2003), (Figure 3);

- 0-3 Months – New Born,
- 4-12 Months – Baby
- 1-3 Years – Young Childhood
- 3-6/7 Years- Pre-School
- 7-10 Years – Late School Ages
- 10-14 Years – 1st Period of Youth
- 14-18 Years- 2nd Period of Youth
- 18-30 Years- Youth (adulthood-maturity)
- 30-45/50 Years – Middle Age
- 50-60 Years – Old-Age

The age order below also is accepted (Kale & Erşen, 2003);

- Early childhood (0-5 years),
- Middle Childhood (6-9 years)
- Young Childhood (10-13 years)
- Adolescence.

Figure 3. People development from infancy to adolescence

Source:Adopted from http://www.womenist.net/tr/p-3859//_turk_cocuklarinin_buyume_egrileri.html., 10 Nisan 2009.

People are human beings who drive their lives in social relation systems. Therefore, sport refers to people's being in interaction with many institutions of society such as education, health and culture. However, their purpose should not be only this one and sport should also be used for education (Akyüz, 1981). Here, the meaning of education is the education of the whole personality to create a well-rounded character. Thus, sports education anticipates physical education as well as mental education (Kale & Erşen, 2003). Education is one of the most important compounds of sport, sports provide a proper education period in life. The indicator of development of sports in a country depends on whether or not the number of sportmen is adequate. Sport environments consists of elements as follows;

- Sports arena and facilities
- Sport equipment
- Sport educators and managers
- Sport organizations

If there is one of the above missing in a country then the sport field in that country does not follow a healthy development line (Salman, 1992).

As a result the development of sport depends on the fact of whether or not it is a part of the social, cultural and economical plans of the country and whether there are some proper sport facilities which provide everybody with the benefits of sport. Therefore, there may be some facilities in which people and education institutions can do sport (Sunay, 1998).

As a result of the study, the required principles that may be inputs for the architectural design process are defined with their position in the process as a "sport concept" from individual to children (Figure 4).

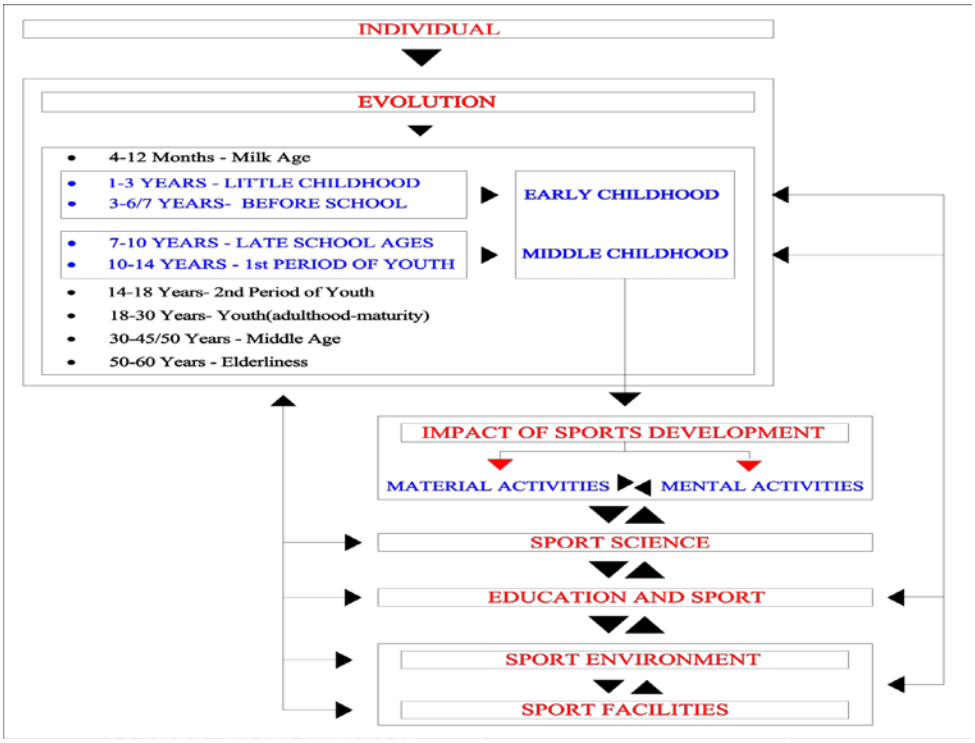

Figure 4. The position of sport concept in the process (Ertaş, 2012).

Source:Adopted from http://www.womenist.net/tr/p-3859//_turk_cocuklarinin_buyume_egrileri.html., 10 Nisan 2009.

2.2.2. Childhood

The fastest growing period in the improvement of humans is childhood and the teenage years. Sport makes it possible to improve the physical health and personality from childhood onwards for the rest of our lives. A lot of researchers have confirmed that most of the behaviours from childhood shape the individuals' current personality and value judgments (Sivri,1993). Sport is necessary for growing children because it makes them develop physically and mentally properly. Today, sport is supposed to play essential roles in every stage of human life. The children's family and school also play an important role in understanding this. Education has always been a beneficial tool for learning. A growing child with this consciousness adopts the act of sport as a life style in the future (Duke et al., 2003).

The most effective tool which helps members of society live as productive, healthy and social individuals is physical improvement and sport activities. The ages of primary school and the high school period are seen to be the best times to make sport a life-long habit (Stonebanks, 1996).

In our country, the education system of 4+4+4 has been followed since 2012-2013. Because the age of starting primary school and the age of starting to do sports are close, sport should first be expanded in primary school and students should be included in various sport activities. Children who begin sport activities from these ages benefit themselves both physically and socially health wise and also benefit the society's structure.

It is a fact that recently sport facilities have increased in number. Since the 1980's, the construction of these kinds of sports facilities has begun according to the needs of children. The aim of these kind of sports is to help children improve themselves by having the proper sport education according to their age groups. Different kind of programmes are developed according to the country and region to which they belong and these programmes serve for different age groups. These programmes aim to create individuals who believe in themselves by bringing in physical and social talents in different ways. In our country, concepts of childhood and sport have become more essential since the 2000s and there have been more ergonomic and reliable programmes and sport facilities developed (Figure 5).

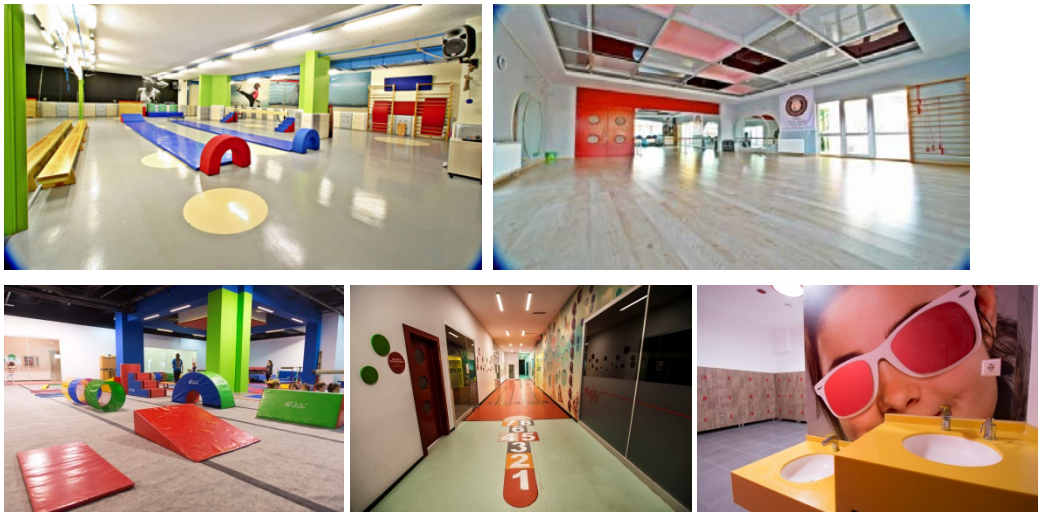

Figure 5. “JAS” sport center (Ankara); ANKYRA WOLT sport center (Ankara)

Source: Adopted from http:/www.Jas.com.tr, 10 May 2011, http://www.ankyraspor.com/, 05 June 2016.

The purposes of children's sports facilities are listed as follows (The ankarasehirkulubu).

- Helping children to do sports which are correct for their talents.
- Providing children with hygienic and ergonomic sport environments.
- Helping children to become elite sportsmen.

These facilities are designed for children. It is thought that doing sports in a good environment affects the improvement of children positively. There are some key points that need to be considered during the design of children's sport facilities, they are listed as follows (Ertaş & Özdemir, 2010).

1.Specifying the age group of the user

2.Anthropometric facilities

3.Gender

4.Specified physical education programmes

5.Organizing the space

- Specifying spaces and standards upon these programmes

- All compounds and units in the space

6. Ergonomic factors

All factors mentioned here affect the stage of design. Because the benefit of the sport is not related with only education. Indeed, the boundaries of space and equipment in it also consolidate the benefit of sports. Since therefore, there appear to be proper sport facilities for children after the process of design. At the end of the literature study within “Children's concept” , required principles that may be input for architectural design process presented their position by being attributed to the relationship between children and sport (Figure 6).

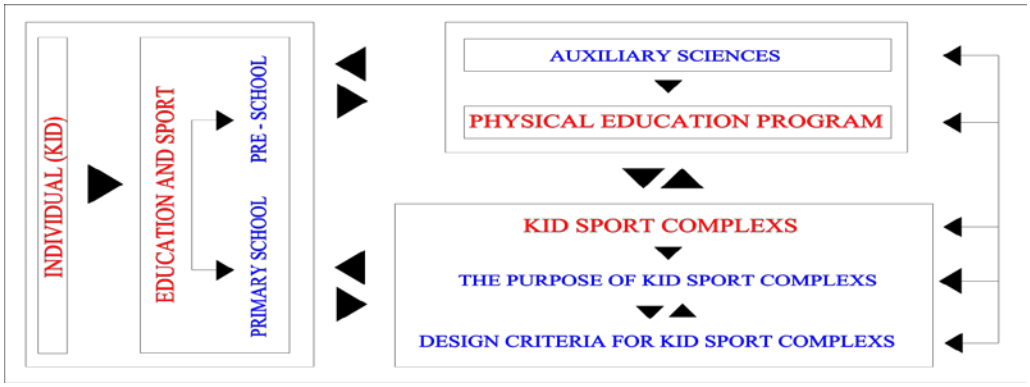

Figure 6. The position of children and sport concepts in the process (Ertaş, 2012).

2.2.3. Ergonomy

Ergonomy means harmony, convenience, and sets a harmony between environments in which individuls work, travel and play (Corlett & Clark, 2009). It aims to humanize individuals' lives and make them succeed in the best way possible. Ergonomy is a disciplinary field.

In the 18th century, during the age of Enlightenment, society gave up the idea of considering children to be little adults and realised that they have different structural features. It became important to make them live in compliance with their features and needs. Because, it is necessary to look for ergonomic standards which comprise the whole day of children's lives just like it is for adults' daily routines.

Children's ergonomics means the necessity of identifying children and recognizing their natural talents, physical, psychological, sociological features, desires, expectations and then identifying how they can use their physical and mental abilities in an environment in order to benefit from their talents at an optimal level (İncir, 1988) . That's why their improvement and anthropometry should be pursued and their physical features should be considered as well. All these features help designers make confident designs for children. Therefore, it can be considered that children's ergonomics are formed by the physiological complexity of children and the concept of confidence.

2.2.3.1. Space Organization and Ergonomics

Ergonomics, the science of human study, which aims to enable functions of the body by developing methods and also regulate compliance of the body with the environment. So, the concept of space and functions of the space became the case of a study. Recently, architecture which settles with life conditions changes, presents alternatives for different spaces upon social life. Sport facilities of which users are children can also be examples for this. The purpose in the design of these facilities is combining programmes and spaces which include a lot of regions for the improvement of children (Ertaş &Özdemir, 2010), (Figure 7).

Figure 7. "Sport Center (France/Paris)"; "Eichi (Switzerland/Niederglatt)", the complex of children and sport

Source:Adopted from http://www.thecoolhunter.net/kids, 10 Mayıs 2011.

The effects of environmental factors on sport and the complex, the effects of physical environment designs on humans since birth and the effects of human psychology on space should also be taken into account. Because we are faced with every single principle of ergonomics during spatial organizing, regulation phases have been formed ergonomically from the point of safety, anthropometry, physiologic, spatial, and psychologically for the "Architectural Design Process" (Öz, 1992).

- **Anthropometric regulation** provides the compliance with children and space. The anthropometric values for children are various and very important. These variables consist of gender, age groups and cultural differences (Lueder &Rice, 2008). Anthropometric measures are the ergonomics data which are used for most of the time. This data shapes the general character of the space as well as all equipment that are used in the space (Ruth, 2000). In the design of child sport facilities, designs in compliance with anthropometric regulations should be done because of the reasons listed above. In these kinds of facilities, sport instruments and equipment that are designed in compliance with children's body measurements are used. The harmony between these instruments and equipment is also an important detail. Other than these, all of the data matter from the point of optimization of the desired movement for spaces in

which these equipments take place. Therefore, anthropometry processes movement, area, shape, space and equipment (Ertaş & Özdemir, 2010).

- **Physiological regulation** is related with whether the optimal efficiency and environmental conditions are provided. It aims to provide sufficient environmental conditions by regulating the act in the space for the user. For this purpose, it is important to provide conditions mentioned below to get the optimum efficiency in child sport facilities (Ertaş, 2012).

1. The act and the given time for physical and mental studies are important. Rest breaks should be taken.
2. At this stage, the space should be designed well according to the needs between the given time period.
3. Sport, which provides physical and mental improvement, should be done with programmes specified according to the age groups and reliable time periods.
4. The instruments and equipment that are used should be in compliance with the physical complexity of children.
5. The sport should not result in tiredness for children.

Optimum environmental conditions depend on the optimum values upon the act, concepts of lighting, air conditions and noise. In order to meet the conditions below, there need to be some requirements listed as follows (Ertaş, 2012);

1. The temperature level of sport spaces, dressing rooms, aisles, stairs should be at a reliable level.
2. When children are doing sports, there should not be sudden changes in temperature.
3. Lighting should not strain the eyes.
4. Noise insulation between spaces should be provided. Children who are doing sports in different spaces should not be affected by each other.
5. Air conditioning systems become very important when the immune system of children is considered. Further, the reliable humidity rate should be balanced for the space in which the children are doing sports.
6. All spaces in the sport complex should be kept tidy and no items which could be dangerous for the health of the children should be found.

- **Spatial regulation;** identifying the collaboration between indoor furniture and human space relationship. This includes the components and units, materials, colour, fiber from indoor regulation while furniture – instruments/equipments system are formed by different equipment. Spaces in which different kinds of sport are done should be designed in compliance with standards in sport centers with parameters and functional distribution between spaces should be well specified. Upon the information from the analysed examples, these organizations are specified by provinces in it. These provinces are (Hendrick, 2000);

1. Team sports: basketball, football, volleyball, handball, salon hockey,
2. Bat sports: tennis, badminton, table tennis,
3. Main areas: swimming, gym, athletics, skill coordination class, athletic educational games,
4. Fitness classes: pilates, step, yoga, fitness,
5. Close contact sports: karate, taekwondo, judo,
6. Recreation sports: fun track, climbing, flying box.

As well as the sports areas mentioned above, there are also birthday, workplace, dressing rooms, bathrooms and toilets, social spaces, management spaces, restaurants, fire exits, security and health rooms, and storage in the complex (Figure 8).

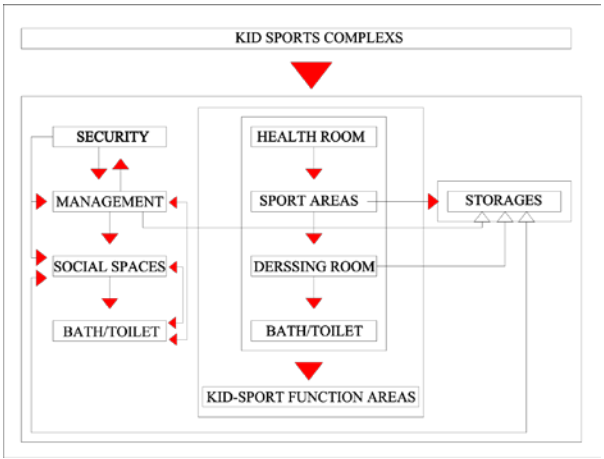

Figure 8. Functional meanings of child sports facilities (Ertaş, 2012).

- **Psychologic regulation** consist of any kind of organization that is done to create a nice space and make the child comfortable in the space (Onat,1982). It is related with any design that the child sees, touches and feels. The aim of the design of a sport complex for children is to provide them with a comfortable and nice place. Such a place takes the individual far from daily routines and protects the motivation of the child who does sport. It contributes to the physical and mental improvement of the child and increases the efficiency of the place.

- **Informational regulation** provides children with a clear place and the skills of moving quickly. That's why, all signboards, letters and informational elements should be understandable and well designed, and age, gender and cultural differences should be taken into account. Or with the information elements provided, the children feel as if they belong to this place.

- **Regulation from the point of security** is a process which starts when the individual perceives the place. It is the appearance of the place. The most important factor is protecting the child from any injuries. Taking precautions for this purpose includes ergonomic regulation. That's why, from the point of the design of secured places for children is related to each design of regulation stages of indoor place ergonomically.

At the end of the literature study of the concept of ergonomics, requires principles that may me inputs for the architectural design process are specified. The principles that help the process be done identified the concept of ergonomics in the process from individual to the child (Figure 9).

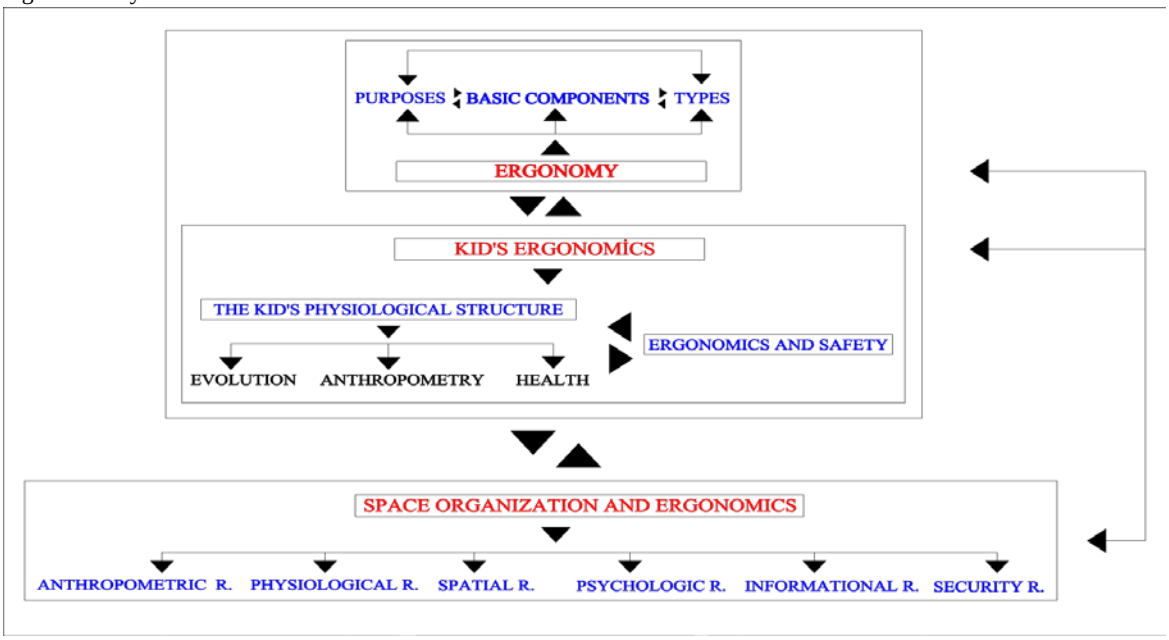

Figure 9. The position of the concept of ergonomics in the process (Ertaş, 2012).

3. RESULTS

The main problem of the architectural design process is the child. In the extent of the idea of a child problem, for the resolution of designation problem of the science of sport and ergonomics, alternatives are found. In the study which combines the science of sport, the child and ergonomics and the concept of the place together, the process of the transparent box process is examined separately in each science field. Different disciplines harmonize the same product according to which was specified in the design process. The factors that affect the model can be defined under three specific topics. The position and interactions of all of these factors in the design process model are specified and a flow chart under each title is presented.

The flow charts, which show the positions of concepts in process, are one of the most important factors which provide the design process upon ergonomic factors that affect physical shaping with data. Since "The Design Process Model for Child Sport Facilities" has developed, with topics of design product obtained from summary charts, by depending on defining the problem, collecting information, analysis, setting a target, synthesis, evaluating, developing and design product of Aksoy's architectural design process model (transparent box) (Figure 10).

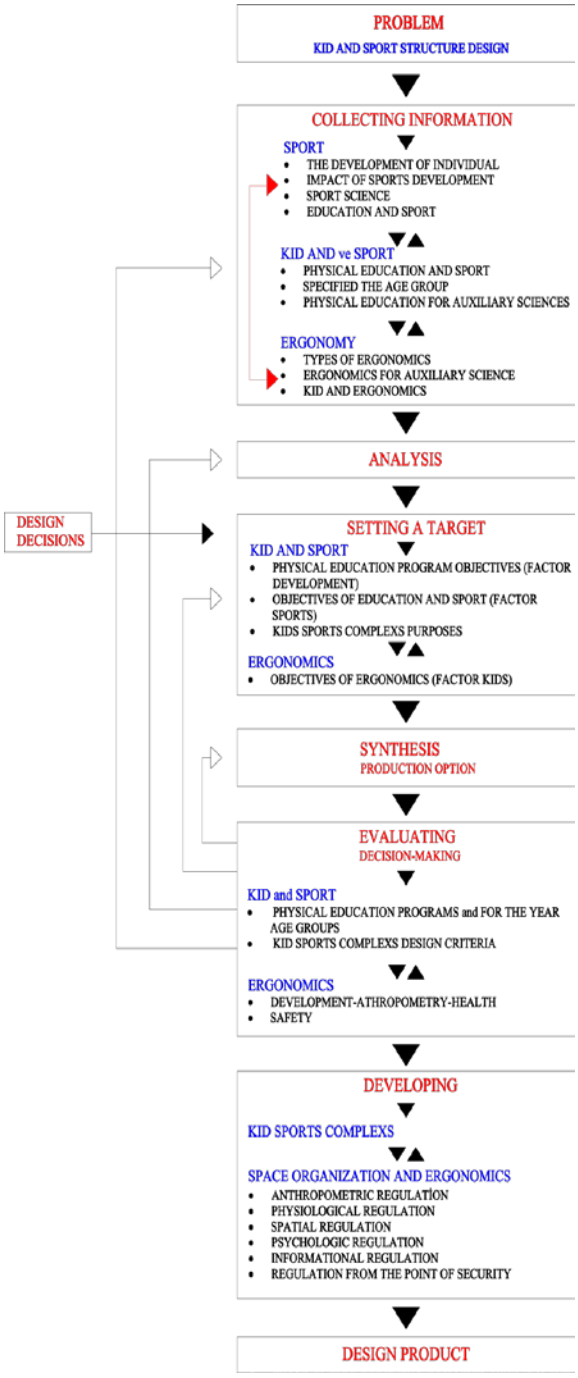

Figure 10. The design process model for child sport facilities (Ertaş, 2012).

4. DISCUSSION & CONLUSION

Children are the most important elements of humanity. Anything that the child interacts with during his improvement affects whether he is going to be a healthy individual or not. Therefore, this is a topic that should be considered primarily for a lot of disciplines beginning with the awareness of doing sport at a young age, the most important factor is that families should be conscious about sport and children and the proper sports environments should be provided as well.

Thus, when the designs of sport facilities for children are considered; the science of sport has been considered and the disciplinary of ergonomics has been evaluated from the act of sports that are done in the physical environment. Inter section of disciplinaries of sport, children and ergonomics that play an essential role in detailing the physical environment for children have been formed and new data have been presented for the designer. The important values during the process of design are as follows;

- Sport
- Children
- Ergonomics

Depending on the study's, a model upon the form of ergonomics on the relationship between sport and children is offered. The reason why the model of three main topics mentioned above are formed is to define the disciplinary of ergonomics by determining criteria of sport children design upon physical education programmes and age groups specified depending on the relationship between children and sport, to emphasise the requirement of presenting ergonimc regulations and space organization upon the concepts of children and ergonomics. For this purpose, Figure 4, 7 and 12 summarize positions of these concepts in the Architectural Design Process.

Inferences obtained in the extent of this study, are thought to be a source for designers and users who are responsible for the organization of the space. Therefore, it is considered that on the basis of childhood, the awareness of families and other science fields dealing with children will increase in order to make children arbiter on both national and international sport organizations. The results obtained from the study can be ordered as follows;

- Converting sport spaces to safe and healthy places in order to encourage children to do sports by keeping them away from possible danger and injuries. Designing equipment in these spaces according to the skills and features of children; making the environment which is designed upon physical programmes, correct for children; thus, providing them with meaningful, useful and interesting activities that they are doing by letting them prove themselves and use their skills.
- Analysing the qualifications of spaces and compiling information about it in order to build qualified sports facilities for children in Turkey.
- Analysing information that can be used in design of different spaces and constituting the phases of it.
- Presenting the basic speculative information for any space that requires sport facilities, child spaces and ergonomic regulations that are subjected to

studio studies and education programmes like architecture and interior architecture.

In this respect, this can be summarized as a study which presents inputs and outputs, factors which affect the design process model and the process that impresses the ergonomic formation upon the child/sport relationship as a result of Aksoy's architectural design process (Figure 11).

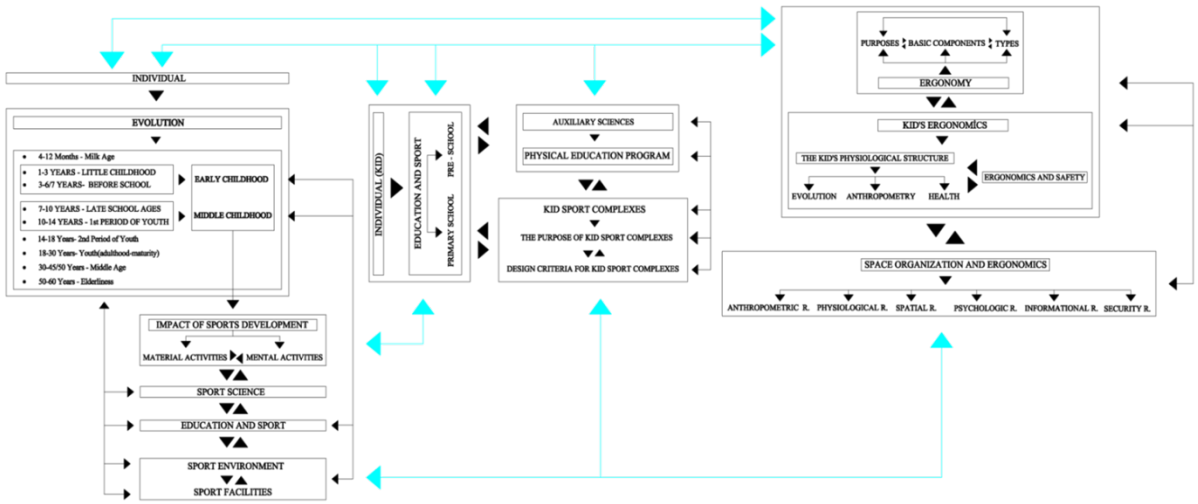

Figure 11. The summary of the design process model for ergonomic factors that affect physical formation upon child/sport relationship (Ertaş, 2012).

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