

# Scientific teamwork – a particular approach

Zespołowa praca naukowa – szczególne podejście do problemu

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## Abstract

The purpose of this article is to discuss the significance of academic collaboration within cardiovascular medicine and surgery, in both clinical and research settings, at a major academic institution in Europe.

**Key words:** teamwork, perspectives, young colleagues, cardiology, cardiac surgery

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## Introduction

In recent years cardiovascular research has become increasingly difficult – requiring a wide variety of personal, technical and professional competencies. The challenge is to develop novel research ideas, given that compared to former times, many 'important questions' have already been answered. In addition, cardiac research is limited by several factors, for example human capital (many people do clinical work and research in parallel, as described below).

One solution for improving research production consists of creating an interdisciplinary cooperation team – namely one that combines each individual's personal strengths and professional expertise in order to provide high quality research. In this article we provide an example of collaborative research between two young academic investigators: a cardiologist and a cardiac surgeon working successfully together.

## Requirements for successful research

To be successful in the field of research there are at least **eight** major requirements of great importance:

- 1) time,
- 2) money,
- 3) infrastructure (facilities, personnel, equipment, technical requirements, etc.),
- 4) knowledge,

- 5) leisure, motivation,
- 6) ideas, inventions, visions,
- 7) discussions,
- 8) cooperation and collaborations.

This article will mainly focus on the last four requirements, assuming the first four are inherently present!

## Cooperative and collaborative research

Cooperative and collaborative teamwork in research is defined as the effort made by interdisciplinary research groups (e.g. interdisciplinary collaboration between cardiologists and cardiac surgeons), composed of individuals working either: 1) in the same hospital, 2) in the same country (national) or 3) even in multiple countries (international).

### Advantages of cooperation and collaboration

First, this is characterized by at least two different perspectives and approaches.

- 1) Combining different skills is essential for high quality research.
- 2) Communications and exchange of information can potentially lead to an impressive increase in the number and diversity of research projects. This is a widely recognized phenomenon; however, its characteristics, benefits, drawbacks and efficiency are hardly ever objectively measured.

An increase in the power of the workforce is absolutely beneficial in research, especially for those working on

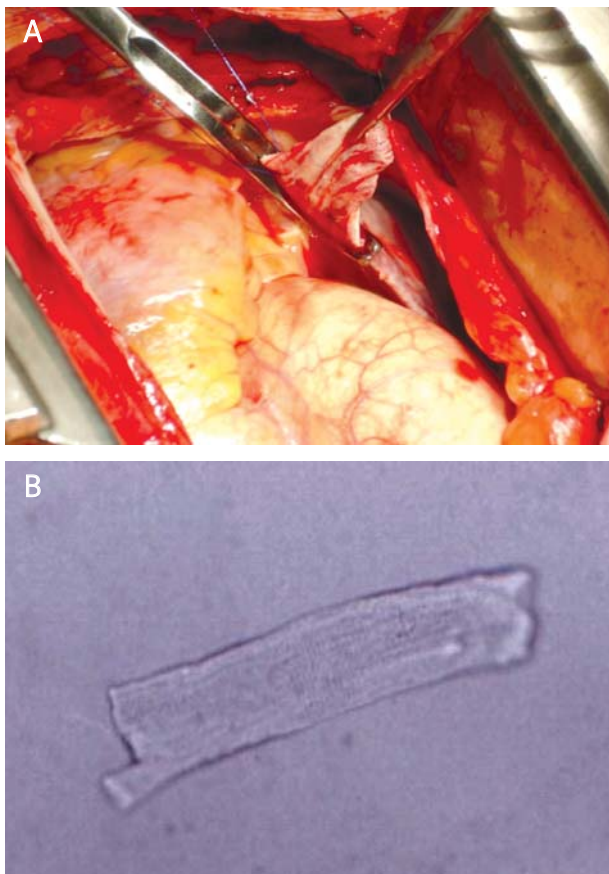
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research and clinical duties in parallel. There are periods of hard clinical work, but also time to do 'pure research' in the lab. Thus it is reasonable for two or more researchers to take these periods in turn, which may result in more stable development of projects. In the light of this, one is able to avoid or attenuate changes between productive and rather low intensity periods. Moreover, in busy times, e.g. to collect new data for the revision of a manuscript in a defined time (in general three months), an increase of manpower is unaffordable.

Another important point to mention is the necessity of an increasing network: meeting colleagues from different departments, hospitals or countries who serve as discussion partners. The development and quality of ideas is markedly improved by combining the knowledge of more than one person. Examples of the benefits from collaborative research cooperation include the following:



**Figure 1. A** – open heart surgery of a CABG. The right atrial appendage from patients with sinus rhythm or atrial fibrillation was provided by Dr. Schmitto. **B** – Dr. Sossalla performed isolation of human atrial cells out of the right atrial appendage. Therefore, special experiments, e.g. patch-clamp technique, could be applied in order to investigate atrial fibrillation [3]

**Grants:** cooperative grant applications are more likely to be successful than single-person or single-department applications.

**Use of facilities:** research equipment is extremely expensive. Thus sharing e.g. setups and instruments will lead to savings in this field, too.

**In-vitro and in-vivo investigations:** while cardiologists more likely and more often perform in-vitro investigations to find scientific solutions in basic science research, cardiac surgeons often use large animal in-vivo models in order to answer their specific scientific questions. Both methods, separately and independently performed, reveal several disadvantages which can be avoided by cooperative collaborations.

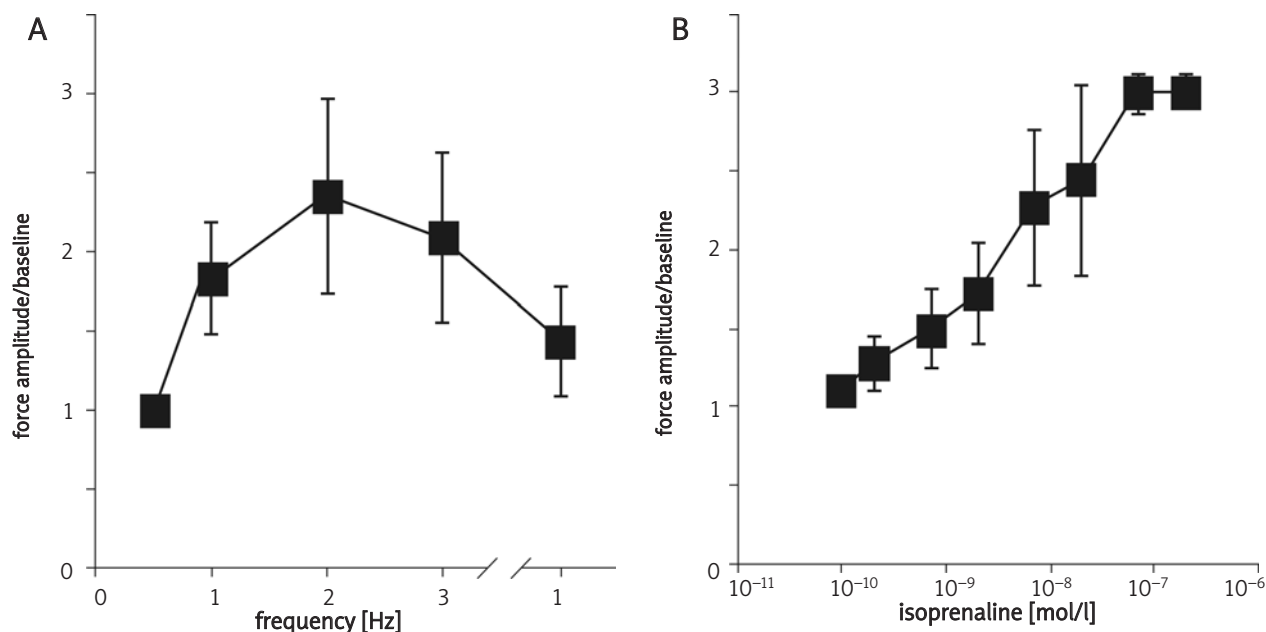
There are many additional reasons for which collaboration in research is very important and there is accumulated experience on these.

### Example

Since 2002, two young clinicians, Dr. S. Sossalla (cardiology resident) and Dr. J.D. Schmitto (cardiac surgeon) have been collaborating clinically and experimentally at a German university hospital, in the field of cardiac research. Each of them had started his research career independently in his specific field of interest [1, 2]. However, they eventually recognized that there were different skills necessary to become more successful. Thus, they started intense research collaboration. Due to the fact that an internal medicine doctor has a different perspective than a surgeon (and vice versa) research problems had been analyzed from two different points of view. This resulted in the chance to provide at least two different approaches for the solution and investigation of problems. Therefore, we provided our techniques to each other, resulting in tissue and technique delivery. Schmitto supported several projects of Sossalla on heart failure and atrial fibrillation, e.g. the role of the late sodium current in atrial fibrillation by planning and performing the collection of the necessary right atrial appendages of patients



**Figure 2.** Dr. Schmitto performing a cardiac operation



**Figure 3. A** – mean force amplitude during increasing frequencies of isometrically twitching sheep muscle strip preparations (n = 3 out of one sheep). Muscle strips were obtained from a sheep heart which was sham operated by Dr. Schmitto. **B** – isoprenaline sensitivity can also be investigated by doing muscle strip experiments. This parameter beside others provides new insights into myocardial function since it is not possible to evaluate them in-vivo

(Figure 1 A) with atrial fibrillation or sinus rhythm [3]. Dr. Sossalla's contribution was extremely important since perfect organisation is required to perform cell isolation (Figure 1 B) and consequent patch-clamp and fluorescence measurements (several people are needed to collect those data in a few hours).

Additionally, he provided his surgical skills in small animal projects. Dr. Sossalla reciprocated by helping with technical aspects and experimental setups in Schmitto's work such as the muscle strip technique (Figure 2.). While Schmitto successfully established a new large animal model to create chronic heart failure in sheep being induced by multiple sequential coronary microembolization (Figure 2), Sossalla investigated the myocardial contractility in vitro (Figure 3. A, B). Isolated trabeculae were therefore investigated focusing on isometric twitching in a setup with force transducers. In-vivo experiments cannot rule out questions under defined conditions as is possible in vitro, e.g. sarcomere length, or beta adrenergic stress of frequencies. Therefore, this technique provides additional information about inotropic responses, Ca<sup>2+</sup> and isoprenaline sensitivity, stretch behaviours and more (Figure 3. A, B). Those experiments were done in parallel with Schmitto's scientific investigations in this sheep model. Hence, this cooperation is extremely time and animal saving (more questions can be answered with each sheep). Taken together, the in-vivo haemodynamic and contractile data, blood parameters and histology of the hearts greatly increases the momentum of our work in the field of cardiac research.

## Summary

Cooperative and collaborative teamwork is of great importance to perform high quality research nowadays, especially for young investigators.

Therefore, we strongly recommend interdisciplinary in-hospital cooperation in order to increase effectiveness and scientific output (publications).

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