

26. November 2024

**Stellungnahme zum  
Leibniz-Institut für Arbeitsforschung  
an der Technischen Universität Dortmund (IfADo)**

**Inhaltsverzeichnis**

1. Beurteilung und Empfehlungen .....	2
2. Zur Stellungnahme des IfADo .....	4
3. Förderempfehlung .....	4

**Anlage A: Darstellung**

**Anlage B: Bewertungsbericht**

**Anlage C: Stellungnahme der Einrichtung zum Bewertungsbericht**

## Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam außerhalb einer Hochschule gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.<sup>1</sup>

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Die Stellungnahmen des Senats bereitet der Senatsausschuss Evaluierung vor. Für die Bewertung einer Einrichtung setzt der Ausschuss Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 19. und 20. Februar 2024 das IfADo an der Technischen Universität Dortmund. Ihr stand eine vom IfADo erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das IfADo nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 26. November 2024 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

## 1. Beurteilung und Empfehlungen

Der Senat schließt sich den Beurteilungen und Empfehlungen der Bewertungsgruppe an.

Das Leibniz-Institut für Arbeitsforschung an der TU Dortmund (IfADo) untersucht die Herausforderungen der modernen Arbeitswelt für die Gesundheit von Berufstätigen. Im Mittelpunkt der Arbeiten in den vier Abteilungen stehen die toxischen Eigenschaften von Arbeitsstoffen, die Wirkung von Arbeitsbedingungen auf das Immunsystem, die neurobiologischen und psychologischen Voraussetzungen für Arbeitsleistungen sowie die ergonomischen Anforderungen an Arbeitsumgebungen.

Das Institut hat sich **seit der vergangenen Evaluierung** sehr gut weiterentwickelt. Es richtete sich wie geplant an dem damals noch jungen Konzept aus, über die „Gehirn-Leber-Immunsystem“-Achse die lebens- und verhaltenswissenschaftlichen Kompetenzen des Instituts besser zu integrieren. Die abteilungsübergreifende Zusammenarbeit wurde auch über die Einrichtung einer Zentraleinheit Systemmodellierung verbessert und so gemeinsame Methodenkompetenzen aufgebaut. Es wird empfohlen, das IfADo als Institut zur Erforschung der Zusammenhänge zwischen Gesundheit und Arbeitsanforderungen inhaltlich weiter zu profilieren und sichtbar zu machen.

Dazu bestehen ausgezeichnete Voraussetzungen in den hohen fachbezogenen **Leistungen** der vier Abteilungen Toxikologie, Immunologie, Psychologie/Neurobiologie und Ergonomie,

---

<sup>1</sup> Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e. V.

die dreimal als „sehr gut bis exzellent“ und einmal als „sehr gut“ bewertet werden. In der Forschung werden innovative, zum Teil herausragende Ergebnisse erzielt und in international anerkannten Fachzeitschriften veröffentlicht. Forschungsinfrastrukturleistungen erbringt das IfADo etwa im Rahmen der seit 2016 durchgeführten *Dortmunder Vitalstudie*, mit der das Institut bereits eine hohe Sichtbarkeit erreicht. Im Transfer bringt es seine Expertise in wichtige Gremien ein, die Richtlinien und Gesetze erarbeiten, beispielsweise in die Ständige DFG-Senatskommission zur Überprüfung gesundheitsschädlicher Arbeitsstoffe (MAK-Kommission). Wie empfohlen wird in Projekten zunehmend auch mit Unternehmen zusammengearbeitet. Zudem entwickelt das Institut Alternativen zu Tierversuchen, die in toxikologischen Routine-tests zur Anwendung kommen.

Die Einrichtung der Zentraleinheit Systemmodellierung einschließlich eines Magnet-Resonanz-Tomographen (MRT) ermöglichten Bund und Länder über zusätzliche Mittel und erhöhten die **institutionelle Förderung** dauerhaft von 10 M€/Jahr (Schnitt 2013–2015) auf 14,4 M€/Jahr (Schnitt 2021–2023). Die **Drittmittel** wurden seit der letzten Evaluierung auf im Schnitt 4 M€/Jahr gesteigert, ihr Anteil am Gesamtbudget liegt mit 21 % ähnlich hoch wie zuvor. Das IfADo warb äußerst erfolgreich Förderungen beim Bund (BMBF), beim Land Nordrhein-Westfalen (europäische Regionalförderung EFRE) und zuletzt auch bei der DFG ein. Die **gerätetechnische Ausstattung** des Instituts ist hervorragend und wird kontinuierlich erweitert. Auch die IT-Infrastruktur wurde ausgebaut und wie empfohlen ein Forschungsdaten-Management-System eingeführt. Die Zahl der Beschäftigten im IT-Bereich muss jedoch wieder erhöht werden, nachdem sie in den vergangenen Jahren zurückgegangen ist. Die Raumsituation ist angemessen, allerdings müssen einige Labore klimatechnisch ertüchtigt werden.

In den **kommenden Jahren** möchte das IfADo verstärkt erforschen, wie arbeitsbedingte Belastungen, individuelle Prädispositionen (z. B. in Bezug auf Alter, Geschlecht, genetische und kognitive Faktoren) und Lebensstilfaktoren (z. B. in der Ernährung) bei Erkrankungen zusammenwirken. Die Daten der langfristig angelegten *Dortmunder Vitalstudie* bieten dafür eine hervorragende Grundlage. In diesem Zusammenhang ist geplant, die Präzisionsbildung und die Kapazitäten zur Erhebung und Verarbeitung großer Datenmengen um 12 Stellen und technische Infrastruktur zu erweitern. Zur Finanzierung ist vorgesehen, eine weitere dauerhafte Erhöhung der Bund-Länder-Förderung um 1,9 M€/Jahr (zzgl. eines Eigenanteils von 0,4 M€/Jahr) sowie für die Beschaffung von Geräten einmalig 5 M€ zu beantragen. Das Vorhaben besteht aus zwei Teilen: Nachdrücklich unterstützt wird das Konzept, multimodale Daten auf Ebene von Geweben methodenunabhängig computergestützt zu analysieren (*„Tissue Cartography“*). Die Planungen, Daten auf der Ebene des Gesamtorganismus zu integrieren (*„clinical hub“*), werden ebenfalls unterstützt, sollten jedoch vor einer Antragsstellung geschärft werden.

Das Institut wird von einem fünfköpfigen **Vorstand**, der aus den vier wissenschaftlichen Direktoren und der kaufmännischen Direktorin besteht, sehr erfolgreich geführt. Die wissenschaftlichen Direktoren leiten jeweils eine Abteilung und sind mit der TU Dortmund gemeinsam berufene W3-Professoren.

Die Zahl der wissenschaftlich **Beschäftigten** ist seit der letzten Evaluierung stark gewachsen, ein erfreulich hoher Anteil kommt aus dem Ausland. Um deren Einstiegsprozess zu erleichtern, sollte administrative Unterstützung in englischer Sprache angeboten und das Sprachlernangebot erweitert werden. Das Institut bietet sehr gute Möglichkeiten zur Weiterentwicklung in

frühen wissenschaftlichen Karrierephasen. Es gelingt sehr effektiv, über Nachwuchsgruppen neue Themen am IfADo zu etablieren. Seit der letzten Evaluierung wurden sechs Gruppen mit Zustimmung des Wissenschaftlichen Beirats in dauerhafte Forschungsgruppen überführt. Die Entscheidungskriterien und -prozesse sollten schriftlich festgehalten und institutsöffentlich zugänglich gemacht werden. Die Promovierenden sind eng in die Arbeit der Abteilungen eingebunden, wo sie sehr gut betreut werden.

Am IfADo sind **Frauen und Männer** im wissenschaftlichen Personal etwa gleich stark vertreten, nach wie vor muss aber auf Leitungsebene eine Verbesserung erreicht werden, denn keine der vier Abteilungen und nur drei der 11 Forschungs- und zwei Nachwuchsgruppen werden von einer Frau geleitet. Nachfolgeoptionen sollten auch in dieser Hinsicht gut vorbereitet werden.

Das Aufsichtsgremium begleitet die Arbeit des Instituts in überzeugender Weise. Um die Unabhängigkeit des **Wissenschaftlichen Beirats** zu gewährleisten, sollten Forschende, die eng mit dem IfADo zusammenarbeiten, dort nicht vertreten sein. Das Institut sollte Besetzungen zudem dazu nutzen, den Anteil an Beiratsmitgliedern aus dem Ausland zu erhöhen. Laut Satzung besteht die Möglichkeit, Mitglieder in besonders begründeten Fällen über die üblichen zwei Amtsperioden hinaus erneut zu wählen. Diese Option sollte zukünftig entfallen.

Neben der TU Dortmund **kooperiert** das IfADo erfolgreich mit der Ruhr-Universität Bochum, u. a. in einem Sonderforschungsbereich und dem „Deutschen Zentrum für Psychische Gesundheit“. Auf regionaler Ebene bildet das Institut mit verschiedenen anwendungsorientierten Einrichtungen einen leistungsfähigen Zusammenschluss zum Thema Arbeitsforschung und auf europäischer Ebene ist es in große Forschungsnetzwerke eingebunden.

## 2. Zur Stellungnahme des IfADo

Der Senat begrüßt, dass das IfADo beabsichtigt, die Empfehlungen und Hinweise aus dem Bewertungsbericht bei seiner weiteren Arbeit zu berücksichtigen. Den Einwand der Abteilung Toxikologie, es fehle eine Bewertung der Arbeitsgruppen in der Abteilung, teilt der Senat nicht. Im Bericht der Sachverständigen wird deutlich, dass die Bewertung der Abteilung auf den Einschätzungen zu den Arbeitsgruppen basiert.

## 3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das IfADo als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

## **Annex A: Status report**

### **Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo)**

#### **Contents**

1. Key data, structure and tasks .....	A-2
2. Overall concept and core results .....	A-3
3. Changes and planning.....	A-5
4. Controlling and quality management .....	A-9
5. Human Resources.....	A-12
6. Cooperation and environment .....	A-14
7. Subdivisions of IfADo .....	A-15
8. Handling of recommendations from the previous evaluation.....	A-19

#### Appendices:

Appendix 1: Organisational chart.....	A-23
Appendix 2: Publications, patents, and expert reviews .....	A-24
Appendix 3: Revenue and expenditure .....	A-25
Appendix 4: Staff .....	A-26

## 1. Key data, structure and tasks

### Key data

Year established:	1912
Admission to joint funding by Federal and <i>Länder</i> Governments:	1977
Admission to the Leibniz Association:	1997
Last statement by the Leibniz Senate:	2017
Legal form:	The non-profit Association "Forschungsgesellschaft für Arbeitsphysiologie und Arbeitsschutz e.V." is the legal entity of the institute and maintains it in line with its purpose (see below)
Responsible department at <i>Länder</i> level:	Ministry of Culture and Science of North Rhine-Westphalia (MKW)
Responsible department at Federal level:	Federal Ministry of Labour and Social Affairs (BMAS)

### Total budget (2022)

- € 13.8m institutional funding
- € 3.2m revenue from project grants
- € 0.2m revenue from services

### Number of staff (2022)

- 108 individuals in "research and scientific services"
- 54 individuals in "science supporting staff (laboratories, technical support etc.)"
- 25 individuals in "science supporting staff (administration)"

### Mission and structure

*"The Association promotes research into potentials and risks of modern labour on the basis of life and behavioural sciences. The research contributes to an adequate design of the work environment for the benefit and wellbeing of the working people, the maintenance and promotion of performance, health, and competitiveness."* (Articles of Association – Article 1 (1))

Scientific work at IfADo is structured into **four departments**: (1) Toxicology, (2) Immunology, (3) Ergonomics, and (4) Psychology & Neurosciences. The departments are subdivided into 15 subunits (research groups, research topics, networking groups, junior research groups). **Five central units** (Library/Publication/Documentation, Unit of Medical Research (UMC), Bioanalytics, Systems Modelling, Animal Laboratory) provide technologies to address the research questions. In addition to the core administrative units (HR, Financial Management, etc.), the **Administration** division also includes the technical services, mechanical workshops and IT-Service/Data Management (see appendix 1 for the organisational chart of IfADo).

## 2. Overall concept and core results

IfADo's research aims to promote the wellbeing and productivity of employees. The institute investigates preventive and therapeutic measures that target individual preconditions, as well as the challenges and risks encountered in the evolving modern working environment.

IfADo's research objectives include identifying sources of biological, chemical, psychosocial and ergonomic stressors and understanding their mechanisms of action in cellular, physiological, cognitive, behavioural and physical systems. The institute uses a range of test models including in vitro cell culture, animals, preclinical and clinical human models and aims to translate the obtained insights into prevention and intervention strategies in humans, and at the workplace.

The research in the four departments is organised in two **programme areas**:

- Programme Area I “Health risks” (Departments of Toxicology and Immunology) aims to understand the self-organising principles of cells, organs and organisms and how they are compromised by chemicals and in disease. This leads to prevention of the toxicity of chemicals as well as the adverse influence of lifestyle factors such as stress or ageing on immune cell functions and the activity of the immune system as a whole.
- Programme Area II “Human Performances” (Departments of Ergonomics and Psychology & Neurosciences) conducts research on how individual predispositions as well as mental states affect cognitive abilities and also on how external factors, such as interruptions of task conduction affect information processing and performance. Interventions focus on the workplace level, e.g. on workplace design, but also on the individual level, aiming at improving individual skills and preventing health-endangering factors.

Two research groups are designed as networking hubs working on topics beyond the boundaries of the departments:

- The Networking Group “Neurotoxicology & Chemosensation” (Department of Toxicology) coordinates a research pipeline that investigates the influence of toxic substances and metabolic disruptions from the cellular up to the behavioural level, including a behavioural rodent facility and controlled human volunteer studies.
- The Networking Group “Aging” (Department of Ergonomics) integrates age-related research at the institute, from the biological foundations in animal models to the role of ageing in daily life. The group also organises the Dortmund Vital Study with a focus on age-related changes in cognitive functions that are particularly relevant for work activities.

### *Results*

Between 2020–2022, IfADo researchers contributed to  $\varnothing$  149 publications per year, of which 126 (85 %) were published in peer-reviewed journals (see appendix 2).

The institute highlights the following research results:

- The **Department of Toxicology** discovered a previously unknown mechanism as to how oxidative stress causes a breach of the blood-bile barrier and how this can be ameliorated by a pharmacological intervention.

- Improved techniques to generate hepatocyte-like cells from human induced pluripotent stem cells (hiPSCs) as a basis for in vitro systems were developed.
- The **Department of Immunology** showed that Natural Killer (NK) cells switch their cytotoxic mechanism from granzyme B to caspase-8-mediated cytotoxicity during the serial killing of tumour cells.
- A simplified method to determine a novel metric for immune age (IMMAX) using a limited set of flow cytometry-based immune parameters was developed and validated. Determining the IMMAX for the participants of the Dortmund Vital Study in collaboration with the Department of Ergonomics showed that this marker of biological age has superior predictive capacity for the age-related decline in cardiorespiratory fitness and work ability.
- Besides the influence of monotony and motivation, the **Department of Ergonomics**, by means of neurocognitive parameters, demonstrated the amount of cognitive decline and the time course of attentional focusing during task interruptions.
- The role of eye blinks and horizontal eye movements were investigated as a new approach to study neurocognitive aspects of mental strain and information processing in natural situations.
- The **Department of Psychology & Neurosciences** explored physiological foundations of cognitive processes in the human brain by investigating diurnal variations of cortical excitability and plasticity in parallel with cognitive performance in early and late chronotypes. The data reveal a consistent pattern of how chronotype influence various aspects of human brain functions. This spans from fundamental physiological mechanisms to complex behaviours and advanced cognitive processes, which can be used for targeted adaptation of work and individual conditions.
- A brain stimulation protocol capable of inducing and stabilising oscillatory brain activity in the theta frequency range was developed. This stimulation not only amplifies synchronisation within the theta band but also results in enhanced working memory performance. This validates the causal connection between theta activity and concurrent cognitive functions.

### *Research infrastructures*

IfADo describes the following research infrastructures:

- The Dortmund Vital Study, a longitudinal cohort study, intended to create a dataset that allows for the investigation of core questions about the determinants of healthy ageing at the workplace. The aim is to explore the health and psychological state of employees between the ages of 20 and 70 years with special emphasis on the liver-immune-brain axis. So far, more than 600 participants have been measured using neuropsychological tests, biological samples, genetics, and an extended neurocognitive evaluation. The study is coordinated by the networking group “Aging” within the Department of Ergonomics as a cooperative project of all IfADo departments. It serves external and collaborating scientists as a basis for researching their own topics, e.g regarding dementia, stress, and work ability. Eighteen external collaborative partners use data from the Dortmund Vital Study.
- The new imaging platform, including functional intravital imaging by 2-photon microscopy and label-free imaging techniques such as Raman spectroscopy provides an infrastructure that



attracts researchers worldwide to perform parts of their research at IfADo. Overall, the imaging platform was used in collaborations with external partners for approx. 40 % of its operational time (avg. 7 hrs/day), resulting in joint publications and a DFG-funded project.

- The high-parameter flow cytometry capabilities at IfADo enable several national and international collaborations. About 1/3 of the operational time is used by external partners.
- The MRI unit contributes to research across all departments focusing on cognitive as well as systemic processes (see chapter 3). Between 2022–2023, on average, it was used 7h per day, 2/3 of the time by projects within the IfADo and 1/3 of the time by external institutions in collaborative studies.

### *Transfer*

IfADo develops ergonomic design principles and recommendations for action in occupational medicine for company practitioners and multipliers such as professional associations and the media. The institute is active in a variety of committees for regulation and standardisation.

Two leading scientists of the Department of Toxicology are represented in Permanent Senate Commissions of the German Research Foundation (DFG), also in chairing positions: (a) the Senate Commission for Food Safety (SKLM) and (b) the Senate Commission of Health Hazards of Chemical Compounds in the Work Area (MAK-Commission). In these commissions, the institute's basic research work contributes towards establishing guidelines and binding law. Since 2018, more than 200 substances have been evaluated with contributions of IfADo. One example is the evaluation of the toxicity of fluoride in epidemiological studies, animal experiments and *in vitro* analyses. Furthermore, a scientist is member of the Panel on Food Additives and Flavourings (FAF) of the European Food Safety Authority.

IfADo's technology transfer strategy does not primarily extend to the acquisition and ownership of industrial property rights and patents. The institute's technologies are adapted, optimized and, if necessary, registered for patent.

The institute is engaged in science communication with the general public. IfADo regularly participates in various regional events for the public and organizes its own (digital) dialogue formats. Especially during the pandemic, Twitter and YouTube were used to inform the public. For example, in 2021, the head of the Department of Immunology gave more than 500 interviews, answered questions in 14 podcasts and provided information on COVID-19 vaccinations at 41 events which were presented in social media channels, TV, broadcast, newspapers, and print magazines. The corresponding Youtube format had up to 71.000 views per clip.

## **3. Changes and planning**

### **Development since the previous evaluation**

The main structural development has been the integration of the Systems Modelling programme for which IfADo has received additional funding since 2019. The programme allowed to establish new techniques in all departments, including 2-photon imaging, MRI, MALDI-MSI, RAMAN, high parameter flow cytometry and bioinformatics equipment and staff for data evaluation. The topical focus lies on the liver-brain-immune axis and involves the expertise of all groups at IfADo.

In this framework, the institute established new research pipelines that allow for the study of health effects of work-related factors on different levels, from cellular to organ to organism, including animal models and humans. Examples are the Dortmund Vital Study and the *Mice-to-Men project* that incorporates an animal behaviour unit, 3D-imaging of liver, kidney and brain tissue, an electrophysiological *in vivo* rodent laboratory, as well as neurocognitive, imaging, and neurophysiological laboratories for humans.

Collaborations involving the different departments increased since the last evaluation, including – beyond the above-mentioned projects – stress-related research. The newly established cold pressor laboratory allows to measure extremely fast stress responses based on baroreceptor innervation in a controlled manner. Furthermore, the impact of acute stress responses on cognitive performance as well as the contribution of cerebral networks via fMRI is explored, including the alteration of respective dysfunctional effects via brain stimulation approaches. In addition, immunological responses during acute stress exposure, as well as in chronically stressed people are examined.

A key development driven by the project groups of the Department of Toxicology and further departments was the establishment of an imaging facility. Based on these techniques, basic principles of liver physiology as well as molecular mechanisms of liver diseases and hepatotoxicity were investigated.

The Department of Immunology established high parameter flow cytometry instruments and metabolic analyzers. This was paralleled by the development of analytical tools and methods to analyze such high-dimensional data, thereby facilitating novel capabilities for the analysis of immune cells. With these new analytical capabilities, the immunological age of an individual can be determined. A further research focus was the interaction between the nervous and the immune system.

The MRI unit situated in the Department of Psychology & Neurosciences enhances opportunities to explore the physiological foundation of work-relevant cognitive functions together with brain stimulation approaches, the exploration of individual preconditions relevant for psychological, and behavioural processes, and broadens the methodological portfolio of the longitudinal Dortmund Vital Study. It furthermore facilitates translational *in vivo* examinations of mice in a 3T human scanner to investigate the metabolism of various organs throughout a mouse's lifespan.

Taken together, this research aims to explore work-relevant environments and individual factors, including diseases, nutrition, age, and toxic substances at the behavioural, electrophysiological, and neuroimaging levels.

The institute lists the following structural changes at management level:

### *Research Groups*

- 2021: Two BMBF funded Junior Research Groups were continued as the Research Groups „Intravital Toxicology“ and „Bioimaging“ (Dept. of Toxicology).

- 2020: The Junior Research Group “Neuroimmunology” was transferred into the Research Group “Neuroimmunology” (Dept. of Immunology). The head was conferred to an apl. Professor at the Medical Faculty of the University Duisburg-Essen.
- 2020: The Junior Research Group “Working Memory” was transferred into the Research Group “Information Processing” (Dept. of Ergonomics).
- 2018: The Junior Research Group “Cellular Toxicology” was developed into the two Research Groups “Cellular Metabolism” and “Interorgan Toxicology” (Dept. of Toxicology).

#### *Junior Research Groups*

- 2022: Establishment of the Junior Research Group “Regulatory networks of stem cell differentiation” (Dept. of Toxicology).
- 2020: Establishment of the Junior Research Group “Neuroimaging & Interindividual Differences” (Dept. of Psychology & Neurosciences), with a new head joining the institute. In 2023, he received a W2 professorship in joint appointment with TU Dortmund.

#### *Central Units*

- 2023: The previous Central Unit “Clinical Occupational Medicine” is continued as “Unit of medical research (UMC)” (Dept. of Toxicology).
- 2018: A new head took over the Central Unit “Analytical Chemistry” (Dept. of Toxicology), which was renamed to “Bioanalytics”.

### **Strategic work planning for the coming years**

As a core objective, the institute plans to expand knowledge on the multidimensional association of work-related strain and various diseases that impact work ability. Special emphasis will be given to interindividual differences such as age-related changes, cognitive functions, genetics, psychological conditions, gender, and other traits. Additionally, lifestyle factors such as exercise and nutrition and new demanding working conditions will be investigated. The ultimate goal is the development of prevention and intervention measures to promote and maintain health and wellbeing throughout the working life.

### **Planning for additional funds deriving from institutional funding**

The institute identified three key areas which, when explored, will lead to a better understanding of the pathomechanisms of lifestyle and work-relevant diseases and result in novel and improved diagnostic, preventive and therapeutic approaches:

- (1) Data from ‘conventionally disparate’ but complementary methods, such as microscopy, MRI, mass spectrometry, transcriptomics, cognitive neurosciences, and flow cytometry from cellular models to humans will be integrated into a correlated multi-dimensional data structure.
- (2) The interplay of various organ systems such as the liver, kidney, immune system, and brain in the progression of disease will be considered in order to fully elucidate underlying causes of disease development.

(3) The resulting complex data structure will be analysed using state of the art computational techniques, including machine learning approaches to ensure appropriate, data-driven deductions.

Along these key areas IfADo outlines two exemplary highly prevalent, globally relevant conditions for occupation-related diseases that will be investigated in the future:

Research focus 1: **Metabolic dysfunction-related liver disease (Tissue Cartography)** aims to investigate metabolic dysfunction-related liver disease (MAFLD), a lifestyle-associated metabolic condition affecting multiple organ systems beyond the liver that results in a number of diseased states, including neurological diseases, nephropathy and cancer, thus impacting work ability. The research is based on studies at the cellular and organ level in animals, the results of which are then implemented in studies in humans, including patients.

Research focus 2: **Stress-related contributions to burnout and depression** aims to extend current approaches to the stress-related and work-relevant syndromes burnout and depression. To perform respective studies in patients and employees at risk, a **clinical hub** at IfADo is planned to initiate and continue collaborations with regional hospitals and companies and to achieve sufficient sample sizes. Patients will be pre-diagnosed at the hospitals, their primary physicians, or by the occupational physicians at their companies. The research follows a top-down approach, starting with a specific syndrome in humans, which is then translated to animal and cellular studies.

The institute aims for additional institutional funding to work in the field of “Precision imaging and big data integration for understanding the pathomechanisms of work and lifestyle-related diseases and their prevention” thereby expanding the existing technical infrastructure:

#### **Tissue cartography (Research focus 1)**

- A 3D electron microscopy with serial-block face imaging
- Multiphoton laser microscope with beam-shaping
- Integrated spatial sequencing instruments
- SRS upgrade for CARS to allow imaging of an enhanced set of chemicals and metallic ions
- Personnel: two scientists (E14), one technician (E9)

#### **Clinical hub (Research focus 2)**

- Electrophysiological laboratory with EEG including a full EEG-based mobile setup for field studies
- EMG, and non-invasive brain stimulation tools (TMS, tES, and transcranial ultrasound stimulation)
- Clinical Chemistry analyser for analysis of immunological parameters in blood and saliva samples
- Personnel: two scientists (E15), three scientists (E14), two technicians (E9)

#### **Common equipment**

- Computational cluster and storage for handling of large datasets
- High-performance gradient system upgrade of the MRI
- Personnel: one scientist (E14), one technician (E9)

Overall, 12 additional staff members are to be financed, amounting to personnel costs of 900 k€ in 2030. In addition, the institute plans approximately 600 k€ p.a. for consumables and 380 k€ for maintenance contracts. In total, IfADo calculates investment costs of 5 M€ between 2027–2029 and a permanent additional institutional funding of 1.88 M€ from 2030 on. The Board of Trustees agrees to propose the planning for an “extraordinary item of expenditure” in the evaluation package.

„Extraordinary item of expenditure“: summary of funds planning

	2027	2028	2029	Permanently
<b>Own funds + additional funds =</b> „extraordinary item of expenditure“	3170 k€	3150 k€	3150 k€	2300 k€
<b>Own funds</b> from existing funding by institution (at least 3 % of core budget)	420 k€	420 k€	420 k€	420 k€
<b>Additional funds</b> of institutional funding	2750 k€	2730 k€	2730 k€	1880 k€

## 4. Controlling and quality management

### Facilities, equipment and funding

Between 2020–2022 the institute’s budget amounted to  $\emptyset$  18.5 M€ p.a, of which 14.4 M€ came from institutional funding. Since 2019, IfADo has received additional institutional funding of 2.3 M€ p. a. for the installation of the Central Unit “Systems Modelling” (see chapter 3).

In the same period, revenues from project grants were  $\emptyset$  4 M€ p.a. (22%). Of these, an average of annually 2.16 M€ was obtained from the Federal and *Länder* governments, 1.15 M€ from the DFG, 323 k€ from the EU, and 327 k€ from other funding organisations. For an overview of IfADo’s revenue and expenditure, see appendix 3.

The IfADo buildings (rented from the BLB – Bau- und Liegenschaftsbetrieb Nordrhein-Westfalen) encompass about 9600 m<sup>2</sup>, of which approx. 4200 m<sup>2</sup> are available as laboratory space. The institute features modern laboratories (including biosafety level 1 and 2) that cover cell and tissue culture and radioactivity experiments and animal housing. Further labs are available, including a virtual and augmented Reality Lab, EEG, MRI and EMG labs, driving simulators, a cold pressor laboratory and non-invasive brain stimulation labs.

The institute also operates a mechanical workshop to directly develop inhouse apparatuses and test environments. The institute’s main instrumentation and technologies include a variety of imaging devices, microscopes, flow cytometers and spectrometers.

Besides these facilities the research activities are supported by two central units:

- The “Unit of Bioanalytics” develops and maintains bioanalytical methods and manages facilities that are used by all departments and is involved in the Dortmund Vital Study.
- The “Unit of Medical Research” (UMC) is led by the Department of Toxicology and supports translational and clinical studies, including studies with human subjects.

### *IT strategy and research data management*

An IT service and data management unit provides network infrastructure, cloud-, file- and web-servers, databases and IT security. The German Research Network (DFN) supports the IfADo with security certificates and the detection of and responses to cyber threats and security breaches. An access control system (ZTNA), which is currently in the planning stage, will give additional guarantee that only authenticated and authorised users, end devices and applications can access corporate resources.

Another important service performed by the IT department is data backup to ensure long-term storage and security of electronic data in accordance with current legal requirements and the principles of good scientific practice. Electronic lab books and equipment scheduling systems additionally support scientific work.

Following a recommendation of the last evaluation, the institute has established an organizational unit *Research Data Management* (OU RDM). It is subject to the internal data management guidelines and comprises representatives from each department and the research units, the data protection officer, as well as representatives from the IT unit and the library. Principally, the OU RDM performs technical, organizational-administrative, and advisory-support tasks in the development and maintenance of infrastructures and procedures for research data management and advises on the handling of research data and their storage in repositories.

### **Organisational and operational structure**

The organs of the registered non-profit organisation "Forschungsgesellschaft für Arbeitsphysiologie und Arbeitsschutz e. V. Dortmund" (legal body of the IfADo) are the General Assembly, the Board of Trustees (supervisory body), the Scientific Advisory Board and the Board of Directors.

The Board of Directors is responsible for scientific and administrative governance. It consists of five individuals, each with departmental responsibility: four scientific directors of the scientific departments and one commercial director who heads the administration.

In the monthly institute colloquium, members of each research group present the most important results as well as its future plans. One aim of this colloquium is to discuss the quality, conceptual novelty and/or application relevance of the data presented. Another aim is to identify opportunities for collaboration and synergies among the groups in the different departments.

The monthly meeting of the research group leaders ("Projektleiterkonferenz") focuses on collaborative studies that are carried out by several research groups at the institute. The meeting also includes information on administrative and public relations issues. Additionally, scientific meetings of the individual research departments take place at least once a week.

### **Quality Management**

Since 2022 good scientific practice at IfADo is regulated in the *IfADo-Codex* following the guidelines of the DFG and the Leibniz Association. The institute has two ombudspersons and its own ethics committee that accompanies its research activities.

IfADo keeps about 1500 mice. Animal experiments are supervised by an animal welfare officer. In this regard, IfADo supports the ethical principle of replacement, reduction, and refinement (3R principle). A major research interest of IfADo is to develop alternatives to animal experiments in the field of toxicology. Cell culture systems of the liver that were developed at IfADo are now used worldwide and have helped reduce the number of experiments in routine toxicological tests.

IfADo aims to publish results in interdisciplinary journals with a focus on the quality of publications. Between 2020–2022, IfADo has published around 64% of its scientific, peer-reviewed journal articles open access. The institute is a member of LeibnizOpen, the Leibniz Association's central open access portal, and has obtained funding for the open access publication of 14 articles between 2020–2022. The transformation process in the library from subscription-based holdings to PAR (Publish and Read) is ongoing. On this basis, the institute has joined the DEAL consortium. In addition, IfADo publishes the diamond-shaped OA journal "EXCLI Journal" (impact factor 2022: 4.6) covering the major research topics at IfADo. Between 2020–2022, abstracts were accessed about 10,000 times a month.

For the internal performance assessment, IfADo uses the self-developed PPM documentation system (PPM: Participative Productivity Management). This system collects data on publications, third-party funding, completed theses, invited lectures, awards, teaching, organisation of scientific events, reviewer and consulting activities as well as public relation output.

Performance-based allocation of funds (PFA) is awarded annually based on the scientific performance of the previous year. 50% of these funds are distributed based on scientific publications, 40 % based on the amount of third-party funds and 10 % by considering the completion of bachelor, master, doctoral theses, or habilitations. Following a recommendation of the last evaluation, the amount of distributed funds was increased from 1.5 % to an average of 4.4 % of the core budget.

### **Quality management by advisory board and supervisory board**

The Scientific Advisory Board (SAB) prepares a statement for the Board of Trustees on the scientific quality as well as the adequacy of financial support for IfADo's research performance. It meets annually and consists of at least five and up to ten members, which cover the relevant research disciplines at IfADo. The members are appointed for a term of four years, re-election for one more term is possible. The SAB conducted an audit in 2021.

The Board of Trustees meets twice a year and advises the Board of Directors and giving impulses for IfADo's strategy in advancing scientific content as well as organizational optimization. The members of the Board of Trustees are partly appointed, partly elected scientists and representatives of the state and federal government as well as representatives of trade unions and employers' associations.

## 5. Human Resources

On 31 December 2022, IfADo had 187 employees (157 FTE), thereof 108 in research and scientific services, 54 technical science supporting staff and 25 in administration. These persons were supported by 37 student assistants and 5 trainees. In addition, IfADo hosted 4 scholarship recipients (see appendix 4).

### Leading scientific and administrative positions

Appointment procedures for leading scientific and administrative staff follow the standards of the Leibniz Association. The scientific directors are recruited as professors in joint appointment procedures with TU Dortmund. The appointments are made within the framework of the “Jülicher Modell”.

In December 2022, there were eleven heads of research groups and three heads of central units at IfADo (for changes see Chapter 3).

### Staff with a doctoral degree

In December 2022, IfADo employed 48 scientists in the postdoc phase. Senior scientists assume responsibility for these postdocs by establishing contacts for them with respective faculties at neighbouring universities and by supervising their scientific development. Regular one-on-one meetings are held with supervisors to promote project development and career opportunities. Postdocs are encouraged to publish their research results in high-ranking journals and to acquire third-party funding for independent financing. The overarching goal is to pursue a career in academia, which is fostered by offering employment contracts (3 + 3 years) that enable the acquisition of a habilitation (venia legendi or its equivalence).

Junior research groups can be established for up to 6 years. They are initiated at the department level. Based on defined performance criteria, IfADo researchers can be promoted to junior research group leaders. Alternatively, highly qualified external researchers can be recruited. After a positive recommendation by the SAB the Board of Directors can promote the junior research group to a regular research group with the possibility of permanent employment for the group leader. During the evaluation period, six junior research groups were transferred to regular research groups and two new junior research groups were established. Since the last evaluation, four scientists left IfADo for professorships at higher education institutions in Germany.

### Doctoral Candidates

In December 2022, 36 doctoral candidates worked at the IfADo, of which 32 were employed on a contract (half of them third-party funded) while 4 held a scholarship. In 2020–2022, 29 doctorates were completed, with an average duration of 4 years (median value).

In the framework of IfADo’s doctoral qualification programme an individual supervision agreement is formulated with the aim of making the relationship between the doctoral candidate and the supervisory team consisting of two to three individuals transparent in terms of content and time. Additionally, a thesis advisory committee including scientific advisors from outside of IfADo can be formed to advise the doctoral candidate on the project on an annual basis. This



committee is not mandatory. It would replace the supervisory team and consists typically of three individuals (1 IfADo, 1 TU Dortmund and 1 from another university). Scientific skills are trained in a series of colloquia, seminars and content-specific meetings organized by the different departments. The qualification concept includes the training in supplementary skills such as presentation techniques, didactic and media competence, and writing funding proposals. The doctoral candidates additionally participate in structured graduate programmes offered by universities: Both medical and cognitive science doctorates are supported by the Ruhr University Bochum Research School, those in Immunology and Toxicology in the doctoral programme of the Faculty of Chemistry and Chemical Biology at TU Dortmund.

The doctoral candidates at IfADo are part of an internal PhD student network (self-organised) and meet regularly. They elect two spokespersons who represent them in meetings with the Board of Directors. The career paths of alumni are tracked within the departments.

### **Science supporting staff**

To continuously promote professional qualification, the technical and administrative staff regularly participate in job-related further training. As part of the Institute's staff development concept, the need for additional training is regularly identified in staff appraisals between employees and their supervisors.

A total of ten triennial apprenticeship training places are available at IfADo for the following occupational groups: biology laboratory assistant, office management assistant, industrial mechanic, and animal keeper. In December 2022, five trainees worked at IfADo. Between 2020–2022, three vocational qualifications were completed.

### **Equal opportunities and work-life balance**

IfADo is committed to the DFG's Research-Oriented Standards on Gender Equality and the Leibniz Equality Standards. The programme budget comprises corresponding targets based on the cascade model. The institute developed a concept for promoting gender equality and diversity in 2013 that was last updated in 2023. IfADo has two gender equality officers and, since 2022, two diversity officers.

On 31 December 2022, half of the institute's scientific staff were women and 35% had a non-German passport (55 and 38 of 108). In scientific leadership positions, in both categories the ratio was 30% (6 of 20).

To support IfADo employees in balancing work and family life, flexible working hours, mobile working as well as flexible childcare is available in the form of a "mobile nursery". Furthermore, IfADo has established a cooperation agreement with an external service provider. This cooperation covers the areas of childcare and nursing/elderly care. In 2023, the Institute received the TOTAL E-QUALITY Award for the fifth time in a row.

An occupational health management complements the efforts. A company reintegration management system is in place for employees returning to work after a longer period of absence due to illness.

## 6. Cooperation and environment

### *Collaboration with universities*

All four department heads are appointed jointly with TU Dortmund (3x W3, 1x C4 as well as the head of the Junior Research Group “Neuroimaging and Interindividual Differences” (W2). Additionally, IfADo has established close cooperations with the Ruhr University Bochum (RUB), where five leading scientists are co-opted by the Faculty of Psychology. In the reporting period, this included access to MRI facilities at the RUB for the Departments of Ergonomics and Psychology & Neuroscience. Since 2020, IfADo has been operating its own MRI facility, which is now also accessible to researchers from neighbouring universities.

The Institute has numerous conjoint projects in the region, including the DFG funded Collaborative Research Center *SFB 1280* – “Extinction Learning” (2017–2025) under leadership of Ruhr University Bochum, and the *International Graduate School of Neuroscience* of the RUB (IGSN).

In the years 2020–2022, researchers of IfADo were involved in nearly 90 teaching activities (173 semester hours in total) at the Technical University (TU) Dortmund, neighbouring universities (e.g. Bochum, Düsseldorf, Duisburg-Essen), and also internationally (e.g. Sevilla, Beijing, Utrecht, Miami, Tehran).

### *Further national networks*

Together with partners from universities, IfADo scientists are involved in large collaborative research networks with a total sum of 12 M€ funded by BMBF, e.g. as member in *LiSym-Cancer Network* (Liver Systems Medicine against Cancer; 23 partner organisations) where the institute contributes with modelling of multi-cellular tissue organization to the diagnosis and prevention of early liver cancer. IfADo is part/member of the *German Centre for Mental Health* (DZPG; Bochum part), where it will contribute work-relevant aspects (in collaboration with BAuA) and, with its expertise in brain stimulation, neuroimaging, and computational modelling approaches, in the DFG Research Unit (FOR 5429) *MeMoSlap* (coordinated by Universitätsmedizin Greifswald, 2023–2026). Also, the institute is a member of the Leibniz Research Alliances “Health Technologies”, “Advanced Materials Safety” and “Resilient Ageing” as well as the Leibniz Research Networks “Bioactive Compounds” and “Immune-Mediated Diseases” (spokesperson is the head of the Department of Immunology).

### *Provision of infrastructure for partners*

The various research instruments and facilities at IfADo are made available for outside researchers on a collaborative basis (see chapter 2). Examples include the use of the flow cytometry equipment by scientists of ISAS and Dortmund MPI, the two-photon microscope by members of the LiSym and *EU-ToxRisk* consortia, the mouse facility by *Lead Discovery Center* (LDC) and further members from TU Dortmund, and the MRI device. Additionally, IfADo performs specific research tasks upon request by external groups such as accident insurance institutions or other professional organisations, including a subcontract for imaging and image analysis tasks for the EU-project *iFLOWS* (advanced technologies for scanning and detection of illicit material for postal services and express courier flows).

### *Local networks*

In addition to several other cooperations, IfADo, the *Federal Institute for Occupational Safety and Health* (BAuA), IPA and other institutions in the Dortmund area form a cluster of labour research. Basic research within this regional network is extended by cooperations with various faculties of TU Dortmund, ISAS (Leibniz Institute for Analytical Sciences), MPI for Molecular Physiology and the Fraunhofer Institute for Material Flow and Logistics (IML).

### **Institution's status in the specialist environment**

In its research field as an interface between the world of work and the life and behavioural sciences, IfADo sees itself as unique. On the national level, IfADo names the *Federal Institute for Occupational Safety and Health* (BauA, Dortmund/Berlin/Dresden/Chemnitz) as the institute with the closest topical connection to IfADo's research profile. A similar relation exists to the institutes of the German Social Accident Insurance Institutions (IPA Bochum, IFA Sankt Augustin, IAG Dresden).

On an international level, IfADo names the *Finnish Institute of Occupational Health* (FIOH) in Helsinki, *National Research Centre for the Working Environment* (NRCWE) in Copenhagen and the National Institute for Occupational Safety and Health in the USA.

## **7. Subdivisions of IfADo**

### **Department of Toxicology**

(51.3 FTE, thereof 25.5 FTE Research and scientific services, 8.8 FTE Doctoral candidates, and 17 FTE Service staff)

Chemicals are indispensable in the modern working environment, and evaluating the risk of these chemicals based on an understanding of their molecular mechanisms remains a major challenge in toxicology. The department approaches this challenge on two levels:

(1) Basic research: The aim is to understand the self-organizing principles of cells, organs, and organisms and how they can be disturbed by chemicals. A central research goal is to compare the mechanisms of toxicity to pathomechanisms of diseases. To reach this goal, the department has been organized into seven interacting project groups and two central units that established specific technologies required to address the research questions.

The department consists of seven subdivisions:

- Research Group „Systems Toxicology“ (17.1 FTE, thereof 11.5 FTE Research and scientific services, 0.7 FTE Doctoral candidates, and 4.9 FTE Service staff)
- Networking Group „Neurotoxicology and Chemosensation“ (8.6 FTE, thereof 4.2 FTE Research and scientific services, 2 FTE Doctoral candidates, and 2.5 FTE Service staff)
- Research Group „Cellular Metabolism“ (6 FTE, thereof 2 FTE Research and scientific services, 2.6 FTE Doctoral candidates, and 1.4 FTE Service staff)
- Research Group „Interorgan Toxicology“ (5.5 FTE, thereof 1.8 FTE Research and scientific services, 1.3 FTE Doctoral candidates, and 2.4 FTE Service staff)

- Research Group „Bioimaging“ (3.3 FTE, thereof 1 FTE Research and scientific services, 1 FTE Doctoral candidates, and 1.3 FTE Service staff)
- Research Group „Intravital Toxicology“ (7.6 FTE, thereof 3 FTE Research and scientific services, and 4.6 FTE Service staff)
- Junior Research Group „Regulatory Networks of Stem Cell Differentiation“ (3.3 FTE, thereof 2 FTE Research and scientific services, and 1.3 FTE Doctoral candidates)

This organization has allowed the researchers, for example, to identify so far unknown principles of liver physiology and pathophysiology and how they are linked to immune, renal, and neuronal functions. Furthermore, knowledge on how deregulated metabolism, in particular glucose and lipid, caused by diet and other stressors contribute to liver disease and cancer progression has been gained.

(2) Researchers are represented in the Permanent Senate Commission of the German Research Council (DFG) as member or chairs: (a) the Senate Commission for Food Safety (SKLM) and (b) of Health Hazards of Chemical Compounds in the Work Area (MAK-Commission). In these commissions, the basic research work contributes towards establishing guidelines and binding law. Since 2018, more than 200 substances have been evaluated with contribution of the department.

With the help of additional institutional funding and third-party funding (BMBF, DFG, EU, EFRE.NRW) of >10 Mio Euros, an infrastructure for intravital two-photon and label-free imaging as well as a modern mouse facility were established. The latter was essential for the discovery of novel mechanisms of toxicity and so far unrecognized pathomechanisms.

Between 2020–2022 the department published  $\emptyset$  43 articles in peer-reviewed journals p.a. In the same period, the revenue from project grants was  $\emptyset$  2.2 M€ p.a. Of these, on average 1.5 M€ were spent from Federal and *Länder* governments, 360 k€ from the DFG, 57 k€ from the EU and 306 k€ from other funders. In total, 14 doctoral degrees and one habilitation were completed.

### **Department of Immunology**

(14.3 FTE, thereof 4.5 FTE Research and scientific services, 5.2 FTE Doctoral candidates, and 4.6 FTE Service staff)

The department investigates the function and regulation of immune cells and studies the involvement of the immune system in work-related diseases and in conditions which affect work ability.

The department consists of two subdivisions:

- Research Group „Immunophysiology“ (7.6 FTE, thereof 2 FTE Research and scientific services, 3.6 FTE Doctoral candidates, and 2 FTE Service staff)
- Subdivision „Neuroimmunomodulation“ with Research Group Neuroimmunology and Research Group Immunomodulation (6.7 FTE, thereof 2.5 FTE Research and scientific services, 1.6 FTE Doctoral candidates, and 2.6 FTE Service staff)

They interact with the other departments of IfADo and work together with regional, national, and international partners. Based on its expertise in the fields of technology development and transfer the department has made contributions to the understanding of the regulation of Natural Killer (NK) cells and the influence of neurotransmitters on immune cells.

Furthermore, the influence of age, sex, and stress on the immune system was investigated. Effects of SARS-CoV-2 infection and COVID-19 vaccinations has been studied combined with a major information campaign and e-Health interventions aimed at behavioural changes to strengthen the immune system have been developed. Therefore, the department has developed a comprehensive research agenda ranging from mechanistic *in vitro* experiments, the analysis of patient materials, clinical studies involving healthy volunteers or patients suffering from relevant diseases all the way to intervention strategies.

Between 2020–2022 the department published  $\emptyset$  15 articles in peer-reviewed journals p.a. In the same period, the revenue from project grants was  $\emptyset$  111 k€ p.a. Of these, on average 29 k€ were spent from Federal and *Länder* governments, 23 k€ from foundations, 47k€ from the DFG and 12 k€ from other funders. In total, five doctoral degrees were completed.

### **Department of Ergonomics**

(43.5 FTE, thereof 18.6 FTE Research and scientific services, 6.2 FTE Doctoral candidates, and 18.8 FTE Service staff)

Digital technologies have become pervasive in work lives, shaping the way humans work in various ways. This shift necessitates the acquisition of new skills and adaptability to evolving work patterns, resulting in rapid changes in mental and psychological strain patterns. Cognitive ergonomics aims to mitigate the associated risks. Its focus lies in the analysis and design of contemporary workplaces, emphasizing cognitive aspects and their neurophysiological underpinnings. At the department, this approach is systematically pursued and extended conceptually.

The department consists of four subdivisions:

- Research Topic „Information Processing“ (4.3 FTE, thereof 2 FTE Research and scientific services and 2.3 FTE Doctoral candidates)
- Research Topic „Experimental Ergonomics“ (25.7 FTE, thereof 5.9 FTE Research and scientific services, 1.1 FTE Doctoral candidates, and 18.8 Service staff)
- Research Topic „Work Design“ (7.6 FTE, thereof 5.6 FTE Research and scientific services and 2 FTE Doctoral candidates)
- Networking Group „Aging“ (5.9 FTE, thereof 5.1 FTE Research and scientific services and 0.8 FTE Doctoral candidates)

These topics span from understanding the fundamental processes of human information processing to designing work environments in the real world. Additionally, they consider the effects of demographic changes and develop methodologies for measuring mental strain in workplaces using neurophysiological assessments.

The research topics investigate the basic mechanisms of information reception and storage and how these processes are influenced by work-related factors. In a next step, research seeks to develop novel methods for studying these issues within actual workplaces, while also considering aspects of mental stress. The knowledge obtained in basic research is applied to practical scenarios in close collaboration with industry partners to improve work environments. The department maintains a cohesive link through the networking group "Aging," which explores the impact of demographic changes and cognitive ageing on work-related aspects.

The collaboration with other departments within IfADo, research even extends into animal experimental studies, with the aim to create a broad and holistic perspective on the evolving world of work.

Between 2020–2022, the department published  $\emptyset$  26 articles in peer-reviewed journals p.a. In the same period, the revenue from project grants was  $\emptyset$  736 k€ p.a. Of these, on average 507 k€ were spent from Federal and *Länder* governments, 167 k€ from the DFG and 61 k€ from the EU. In total, six doctoral degrees and one habilitation were completed.

### **Department of Psychology & Neurosciences**

(24.4 FTE, thereof 13.8 FTE Research and scientific services, 4.4 FTE Doctoral candidates, and 6.2 FTE Service staff)

The relevance of psychological factors for work performance and wellbeing of employees has continuously increased during the last decades due to fundamental changes of work, including cognitive, emotional, and social factors. These are determined by biological factors, including brain physiology, and functional anatomy.

To improve work conditions in a targeted, scientifically based way, it is thus important to improve the understanding of respective psychological processes, and their biological foundations, which is the overarching focus of the two research groups. For work-relevant psychological processes, main activities of the last years included the exploration of psychological mechanisms of task switching and extinction learning, important features in a dynamic working environment.

Furthermore, it was investigated how general cognitive ability, a vital determinant of work performance, is related to genes as well as structural and functional brain characteristics. For revealing the causal relevance of biological factors for psychological processes, brain stimulation tools have been developed, which allow a targeted modulation of brain physiology and use these to alter psychological processes.

A third focus encompasses the exploration of the impact of work-dependent environmental and individual factors on brain physiology, psychology, and behaviour. Since the last evaluation, the department has relevantly grown with respect to staff members, external funding, and collaborative activities. The research portfolio has been enhanced by establishment of an MRI group and a small animal laboratory. Central future plans include broadening of the research agenda by adding a focus on the exploration of work-relevant diseases with the terminal aim to improve conditions via adaptation of work and individual factors.

Between 2020–2022 the department published  $\emptyset$  49,3 articles in peer-reviewed journals p.a. In the same period, the revenue from project grants was  $\emptyset$  601 k€ p.a. Of these, on average 372 k€ were spent from the DFG, 141 k€ from the EU and 81 k€ from Federal and *Länder* governments. In total, four doctoral degrees were completed.

The department consists of two subdivisions:

- Research Group „Neuromodulation“ including Research Group Flexible Control of Behaviour (17.4 FTE, thereof 9 FTE Research and scientific services, 3.8 FTE Doctoral candidates, and 4.6 FTE Service staff)
- Junior Research Group „Neuroimaging and Interindividual Differences“ (7 FTE, thereof 4.9 FTE Research and scientific services, 0.6 FTE Doctoral candidates, and 1.6 FTE Service staff)

## 8. Handling of recommendations from the previous evaluation

IfADo responded as follows to the 10 recommendations of the last external evaluation (highlighted in italics, see also statement of the Senate of the Leibniz Association issued on 28 November 2017, pages B-2/B-3):

1) *“The institute intends to apply for additional funding from the Federation and the Länder [...] to establish a Central Unit on Systems Modelling and Data Acquisition. The Review Board expressly endorses this proposal. In the context of the new unit, however, questions of sustainable data management and open access/open data must be considered to a greater extent than has been envisaged so far. Moreover, to implement the proposal it is mandatory that the relevant conditions are established in IfADo’s IT structure.”*

In the framework of the *central unit Systems Modelling* the institute established new data collection techniques and expanded its IT infrastructure. Therefore, the institute has established an organisational unit ‘Research Data Management’ (OU RDM). This unit performs technical, organisational-administrative and advisory-related tasks associated with the development and maintenance of infrastructures and procedures for the administration of research data. The research data management guidelines established by this unit apply to all projects at the institute, and are committed to the ‘Principles for the Handling of Research Data’, adopted in 2010 by the Alliance of Science Organisations in Germany.

2) *“The course that has been set in the last few years with regard to human resources, contents and organisation has generated potential that IfADo should exploit yet further in future. Above all, it should expand the strategic linkages across all its departments, which should also have implications for future staff recruitment.”*

IfADo has established research projects that span two or more departments. Prominent example is the Dortmund Vital Study, a longitudinal data collection with contributions from all departments. An animal behaviour unit has been established by the Departments of Toxicology, Psychology & Neurosciences, and Ergonomics, which allows to explore the effects of interventions, substances, and work-related diseases and syndromes at the level of single cells, small neuronal networks, and *in vivo* mice models, with respect to their molecular, brain physiological,

and behavioural impact. The newly established MRI junior group (“Neuroimaging and Interindividual Differences”) furthermore serves as a hub for establishing new collaboration projects between all research groups of the institute.

3) *“IfADo should collate its strategic thinking in a mission statement to facilitate communicating its overarching goals.”*

A new mission text for the institute is laid down in the Articles of Association.

4) *“IfADo’s research groups produce diverse results that are of great practical relevance. However, this is not yet sufficiently reflected in collaboration with partners in industry, the volume of funding acquired from industry or the number of patents and licensing agreements.”*

IfADo conducts basic and application-relevant research. Criteria for the quality of this research are, for example, the large extent to which methods developed at IfADo are used worldwide. Recommendations and guidelines developed at IfADo can have an impact on companies, also of a financial nature, e.g., if a reduction of exposure limit values has to be recommended. Therefore, in many cases it is not permissible for IfADo to accept money from industry. The ministries responsible for IfADo (MWK - Ministry of Culture and Science of the State of North Rhine-Westphalia; BMAS - Federal Ministry of Labour and Social Affairs) support IfADo’s position that there may be cases in which an appearance of bias cannot be safely ruled out if money is accepted from industry (‘conflict of interest’). Therefore, we believe that the volume of funding from industry is not a suitable quality criterion for evaluating IfADo’s performance. However, wherever possible (e.g., in the context of EU or BMBF grants, projects in occupational psychology, development of pharmaceutical agents with relevance for work-related diseases, advisory activity), collaborations with partners in industry have increased (see chapter 6).

5) *“IfADo is recommended to clarify the future strategic status of biomechanical ergonomics within the institute at the earliest opportunity. As part of a detailed analysis, the situation of biomechanical research elsewhere should also be considered (analysis of the scientific environment).”*

The reorientation of the institute towards the brain-liver-immune axis also fostered an adaptation of ergonomic research in the direction of cognitive ergonomics. Musculoskeletal load and in particular back strain and disorders as a former central topic of biomechanical research will not be continued in the previous form at IfADo after the retirement of the former head of the Subdivision “Designing Work”. Biomechanical questions on musculoskeletal loading and signs of overload at the research level are dealt with, for example, in Münster, Sankt Augustin, Berlin, Stuttgart and Ulm, as well as in Amsterdam (NL), Auburn (AL, USA), Columbus (OH, USA) and Waterloo (Ont, Can). However, biomechanical aspects in the context of new forms of work (es-



pecially in the context of digitalisation) will continue to be systematically investigated in the research topic of Work Design in close connection with aspects of mental strain. This approach is connected to other units at IfADo.

6) *“The institute is recommended to align the contracts of positions financed by third-party funding more closely with the relevant project lifetime.”*

IfADo states that the contracts of third party-funded staff members are in general aligned to the funding period. However, in rare cases some flexibility is needed. For example, in some interdisciplinary externally funded projects it is necessary to collect data in a first phase, which are then bioinformatically evaluated and modelled in a second phase. The work of these individual project phases can only be carried out by experts with special expertise. In other cases, a limited prolongation of contracts may be necessary to finalise projects, a topic especially relevant during the recent pandemic.

7) *“The institute should continue to maintain tenured positions for highly specialised technical staff. At the same time, it is recommended to offer additional in-service training opportunities to technicians to improve their professional eligibility for positions outside of IfADo.”*

The institute states that it offers permanent positions to highly qualified and specialised technical staff. In addition, it encourages and supports technical staff to make use of additional training opportunities. In most cases this serves to achieve the strategic goals of IfADo. However, due to the high qualification of the technical staff and the attractiveness of the techniques developed at IfADo, the institute is confronted with poaching offers, especially from companies that are able to offer higher salaries. Further improving the suitability of technical staff for positions outside IfADo is therefore not a primary goal of the human resources strategy in times of acute shortage of skilled workers. The aim is to offer the best working conditions in order to encourage the technical staff to remain at the institute.

8) *“IfADo must drive its efforts to promote female researchers in order to increase the proportion of women at leadership level. In the first instance, the institute should enhance its mentoring opportunities and take further steps to improve the situation.”*

IfADo aims to increase the proportion of women at leadership level. For director level positions this has not been possible since the previous evaluation, because none of the Scientific Directors has left or retired. However, improvements have been achieved on group level, with now three female heads of research groups. The institute supports the participation in the mentoring programmes of the Ruhr University Alliance and the Leibniz Association. One of IfADo's group leaders is the current spokesperson of the Leibniz Mentoring Network.

9) *“With reference to supporting individual doctoral candidates' career, the institute should become more proactive in future.”*

Given its diverse scientific disciplines, a generalised scientific programme for doctoral students that includes all scientific topics of the institute does not seem suitable for IfADo. However, the institute has developed a hybrid solution: The doctoral students take part in structured PhD

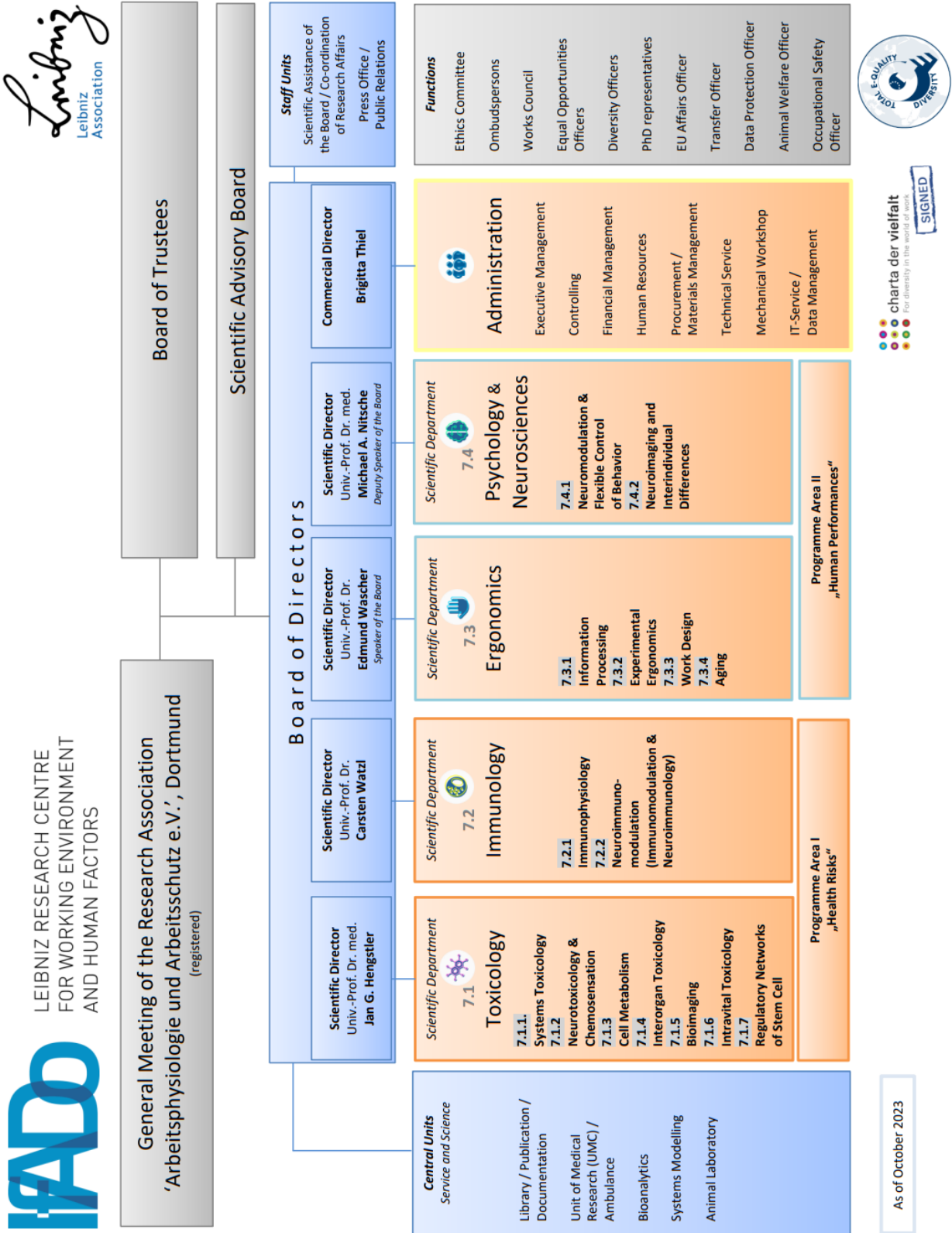
programmes at the different faculties of the surrounding universities in accordance with their research portfolios. In addition, the doctoral students at IfADo are organised and are supported in offering courses for scientific writing, presentations and other soft skills. Finally, career guidelines have been implemented that regulate the criteria for doctoral projects, Post-Doc projects and junior groups.

*10) "It is positive that the institute awards part of its financial support on the basis of performance-related funding. The criteria adopted for this purpose are transparent and generally accepted. In relation to the core budget, however, the funding distributed in this way (approx. 1.5 percent of the core budget) is too low and should be increased."*

IfADo increased the amount distributed by the performance-based funding from 1.5 % in 2017 to an average of 4.4 % of the core budget starting in 2019 (see chapter 4).

Appendix 1

Organisational Chart



**Appendix 2****Publications, patents, and expert reviews**

	Period		
	2020	2021 <sup>1)</sup>	2022 <sup>1)</sup>
<b>Total number of publications</b>	151	144	153
Monographs	0	0	1
Individual contributions to edited volumes	15	22	15 (1)
Articles in peer-reviewed journals	129	117 (1)	131 (17)
Articles in other journals	0	1	3
Editorship of edited volumes	7	4	3

<b>Patents</b>	2020	2021	2022
Applications giving rise to a right of priority (in the calendar year)	0	0	2

	2020	2021	2022
Number of expert reviews	96	83	64
Number of media contributions of IfADo experts due to pandemic themes	20	551	222

---

<sup>1</sup> Contributions that have been accepted for publication but not yet appeared are added in parenthesis.

## Appendix 3

## Revenue and Expenditure

Revenue		2020			2021			2022		
		k€	%	%	k€	%	%	k€	%	%
<b>Total revenue (sum of I., II. and III.; excluding DFG fees)</b>		<b>24,960.5</b>			<b>20,304.9</b>			<b>20,912.2</b>		
<b>I.</b>	<b>Revenue (sum of I.1., I.2. and I.3)</b>	<b>20,554.9</b>	<b>100 %</b>		<b>17,600.3</b>	<b>100 %</b>		<b>17,226.5</b>	<b>100 %</b>	
1.	<u>INSTITUTIONAL FUNDING (EXCLUDING CONSTRUCTION PROJECTS AND ACQUISITION OF PROPERTY)</u>	15,729	77 %		13,592	77 %		13,840	80 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and <i>Länder</i> governments according to AV-WGL	15,729			13,592			13,840		
2.	<u>REVENUE FROM PROJECT GRANTS</u>	4,809.2	23 %	100 %	3,942.8	22 %	100 %	3,209.2	19 %	100 %
2.1	DFG	779.8		16 %	979.8		25 %	1,698.1		53 %
2.2	Leibniz Association (competitive procedure)	1.7		0 %	-0.9 <sup>2</sup>		0 %	0		0 %
2.3	Federal, <i>Länder</i> governments	3,604.1		75 %	1,898.6		48 %	971.4		30 %
2.4	EU	157.9		3 %	687.2		17 %	125.6		4 %
2.5	Industry	0		0 %	-5.3 <sup>2</sup>		0 %	13.5		0 %
2.6	Foundations	0		0 %	35.1		1 %	34		1 %
2.7	If applicable: other sponsors	265.7		6 %	348.3		9 %	366.6		11 %
3.	<u>REVENUE FROM SERVICES</u>	16.7	0 %		65.5	0 %		177.3	1 %	
3.1	Revenue from commissioned work	1.5			0			46		
3.2	Other services	15.2			65.5			131.3		
<b>II.</b>	<b>Miscellaneous revenue (e.g., membership fees, donations, rental income, funds drawn from reserves)</b>	<b>4,405.6</b>			<b>2,704.6</b>			<b>3,685.7</b>		
	<u>Thereof:</u> Institutional funding – self-managed surpluses, cash assets from the previous year	3,119.9			2,522			2,311		
<b>III.</b>	<b>Revenue for construction projects (institutional funding by Federal and <i>Länder</i> governments, EU structural funds, etc.)</b>	<b>0</b>			<b>0</b>			<b>0</b>		
<b>Expenditures</b>		<b>k€</b>			<b>k€</b>			<b>k€</b>		
<b>Expenditures (excluding DFG fees)</b>		<b>24,575</b>			<b>19,973</b>			<b>20,575.8</b>		
1.	Personnel	10,738.6			11,399.5			12,167.6		
2.	Material expenses	3,590.7			2,719.2			3,729.1		
3.	Equipment investments	7,527.4			2,169.9			1,051.4		
4.	Other operating expenses	2,718.4			3,684.4			3,627.8		
DFG fees (if paid for the institution – 2.5% of revenue from institutional funding)		385.5			331.9			336.4		

<sup>2</sup> The negative amounts are due to the fact that the project remainder not spent by IfADo had to be transferred back to the respective project sponsor at the end of the term.

## Appendix 4

## Staff

(Basic financing and third-party funding / proportion of women (as of: 31 December 2022))

	Full time equivalents		Persons		Women		Foreigners
	Total	on third-party funding	Total	on temporary contracts	Total	on temporary contracts	Total
	Number	Percent	Number	Percent	Number	Percent	Number
<b>Research and scientific services</b>	<b>92.3</b>	<b>32.8</b>	<b>108</b>	<b>74.1</b>	<b>55</b>	<b>79.6</b>	<b>38</b>
1 <sup>st</sup> level (scientific directors)	4	0	4	0	0	0	1
2 <sup>nd</sup> level (department leaders or equi.) <sup>3</sup>	0	0	0	0	0	0	0
3 <sup>rd</sup> level (group leaders or equi.)	11	0	11	0	3	0	5
Junior research group leaders	2	0	2	50	0	0	0
Further academic staff in executive positions	2.7	0	3	0	3	0	0
Scientists in non-executive positions (A13, A14, E13, E14 or equivalent)	51.3	38.4	56	83.9	29	82.7	19
Doctoral candidates (A13, E13, E13/2 or equi.)	21.3	49.8	32	100	19	100	9
<b>Science supporting staff (Laboratories, technical support etc.)</b>	<b>45.5</b>	<b>0.2</b>	<b>54</b>				
Laboratory (E9 to E12, upper-mid-level service)	22.1	0	26				
Laboratory (E5 to E8, mid-level service)	12.2	1.6	14				
Animal care (E5 to E8, mid-level service)	1	0	1				
Workshops (E5 to E8, mid-level service)	3	0	3				
Library (from E13, senior service)	1.5	0	2				
Library (E9 to E12, upper-mid-level service)	0.3	0	1				
Library (E5 to E8, mid-level service)	0.3	0	1				
Information technology - IT (E9 to E12, upper-mid-level service)	2	0	2				
Technical (large equipment, service) (E5 to E8, mid-level service)	3.1	0	4				
<b>Science supporting staff (Administration plus middle service)</b>	<b>19.3</b>	<b>3.1</b>	<b>25</b>				
Head of the administration	1	0	1				
Staff positions (from E13, senior service)	0.5	0	1				
Internal administration (financial administration, personnel etc.) (E9 to E12, upper-mid-level service)	7.3	0	8				
Staff positions (E5 to E8)	7.48	11	9				
Building service (E1 to E4)	3.1	0	6				
<b>Student assistants</b>	<b>10.6</b>	<b>31.4</b>	<b>37</b>				
<b>Trainees</b>	<b>5</b>	<b>0</b>	<b>5</b>				
<b>Scholarship recipients at the institution</b>	<b>2.4</b>	<b>100</b>	<b>4</b>		<b>1</b>		<b>4</b>
Doctoral candidates (externally financed e.g. DAAD, foundations)	2.4	100	4		1		4

<sup>3</sup> There is no 2nd level (department leader or equivalent) for the scientific management of the departments (Scientific Directors); they belong to the 1st level and are not double counted here.

## **Annex B: Evaluation Report**

### **Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo)**

#### **Contents**

1. Summary and main recommendations .....	B-2
2. Overall concept, activities and results.....	B-4
3. Changes and planning .....	B-6
4. Controlling and quality management .....	B-7
5. Human Resources.....	B-9
6. Cooperation and environment .....	B-11
7. Subdivisions of IfADo .....	B-11
8. Handling of recommendations of the last external evaluation .....	B-14

Appendix:

Members of review board

## 1. Summary and main recommendations

The Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo) addresses the health of the working population and the design of work tasks and working environments. It targets individual preconditions and sources of stress that influence different system levels, by conducting research into cognitive, psychological, neurobiological, immunological and toxicological factors. The institute employs a broad spectrum of methods deriving from both the life and behavioural sciences.

The institute has made very good progress since the last evaluation. Using additional institutional funding, it has set up a central unit for Systems Modelling since 2020, which, as expected, has strengthened cross-departmental collaboration. IfADo makes very effective use of junior research groups to establish new topics at the institute. Six junior research groups have been consolidated into regular research groups, enabling the institute to retain the expertise of the successful scientists. Two new and promising groups have been set up.

The institute's research leads to innovative, in many cases outstanding, results that are published in internationally recognised journals. The Dortmund Vital Study, a longitudinal cohort study to explore the health and psychological state of employees, collects valuable data. IfADo contributes its expertise to important committees that regulate and standardise guidelines and legislation, and is actively involved in developing alternatives to animal experiments. The performance of three of the four departments is rated "very good to excellent", and one is rated "very good".

IfADo is very well managed by a Board of Directors, which comprises the four department heads as scientific directors, and the commercial director. Since the last evaluation, the institute has grown significantly, especially in research and scientific services. As an affiliated institute of TU Dortmund University (TUD), five of its senior scientists hold professorships there. It also has a fruitful collaboration with Ruhr University Bochum (RUB). It is good to see that IfADo increasingly collaborates with businesses in joint research projects, such as the EU projects *FELICE* and *sustAGE*.

Special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

### Overall concept, activities and results (chapter 2)

1. The institute conducts its work in four departments. As recommended, collaboration between them has been intensified since the last evaluation, largely by aligning the overall concept with biological processes along the liver-brain-immune axis. The review board welcomes this direction, which should now be pursued further. This will enable IfADo to raise its profile and visibility as an interdisciplinary institute for research on the working environment beyond the individual departments, which are already highly regarded in their respective disciplines.

### Changes and planning (chapter 3)

2. IfADo intends to apply for additional institutional funding from the federal and *Länder* governments (*Sondertatbestand*). The aim is to expand its precision imaging facilities and to establish big data integration methods for understanding the pathomechanisms of work- and lifestyle-related diseases and their prevention. From 2027 onwards, additional annual funding of €1.9m (plus €0.42m from own funds) is to be used for technical infrastructure and to finance 12



additional employees. The plans also include common equipment, with a necessary upgrade to the MRI scanner that was purchased during the last strategic expansion, as well as a new high-performance computing cluster.

Specifically, the institute would like to pursue two research topics:

- It plans to investigate metabolic dysfunction-associated steatotic liver disease (MASLD), a disease caused in part by work-related lifestyle factors (e.g. stress-related malnutrition and lack of exercise linked to sedentary occupations). The molecular research addresses aspects at the cellular and organ level in *in-vitro* and animal models, the results of which are then implemented in studies in humans, including patients. The work is to be carried out within the framework of a Tissue Cartography research platform. These plans, which are well thought through, innovative and will advance research in the field, are expressly endorsed.
- The review board also supports the institute's plan to study stress-related contributions to burnout and depression in affected individuals. These important topics are a suitable addition to the institute's research spectrum. However, the plans aiming to set up a "clinical hub" at IfADo need to be substantiated with a detailed staffing plan. In particular, the institute should clarify which phases of clinical trials can be carried out at the institute. The project name "clinical hub" should be reconsidered and then be adjusted to reflect this.

#### Controlling and quality management (chapter 4)

3. The institute's premises are appropriate. However, the air conditioning in some laboratories is in urgent need of improvement, since it is not possible to work in them on hot summer days.
4. IfADo's digital infrastructure was strengthened when the central unit for Systems Modelling was set up and, as recommended, a research data management system was introduced. However, the number of people working in IT has decreased, despite increased requirements. The institute needs to expand its personnel capacities in IT again in the future.
5. In order to ensure the independence of the Scientific Advisory Board (SAB) and good scientific practice, researchers who cooperate closely with IfADo should not be members of the SAB. If members of the SAB enter into collaborations with the institute, they should resign from the board.

Only two of the ten members of the SAB come from institutions outside of Germany. IfADo should use upcoming appointments to increase the number of members coming from abroad.

As is usual at Leibniz institutes, the IfADo statutes allow board members to be re-elected for a second term. In addition, at IfADo, a further re-election is possible in particularly justified cases. This option should be removed and the statutes should be amended accordingly.

#### Human Resources (chapter 5)

6. To simplify the onboarding process for new employees from abroad, language support services should be expanded and administrative support should be provided in English. All employees should be given access to language courses for this purpose.
7. The Junior Research Groups (JRG) are evaluated by the Scientific Advisory Board, and can be converted into regular research groups on its recommendation. This has happened six

times since the last evaluation, and two new JRGs have been set up. It is good to see that, through this kind of tenure track system, IfADo offers scientists long-term career prospects at the institute. To ensure greater transparency in this process, the conditions, criteria and decision-making paths should be documented and made accessible to all employees.

8. The supervision concept for doctoral researchers includes a supervision agreement signed with a supervisory team consisting of two to three individuals. The supervisory team should be expanded into a thesis advisory committee including scientific advisors from outside of IfADo for all doctoral researchers. This is already possible at the moment, but not yet the rule.
9. At the end of 2022, just over half of the employees in the research and scientific services area were women (55 out of 108). However, only three of the 17 research groups (including two junior research groups) were led by women. This is a slight improvement on the situation at the last evaluation, but there are still no women at scientific director level. IfADo is therefore called upon to increase the proportion of women at leadership level. Over the coming years, personnel changes must be used to make improvements in this area.

## 2. Overall concept, activities and results

The Leibniz Research Centre for Working Environment and Human Factors, Dortmund (IfADo) addresses the health of the working population across the life span as well as the design of work tasks and working environments. It targets individual preconditions and sources of stress that influence different system levels, including subcellular units, cells, organs and the whole organism, employing a broad spectrum of methods deriving from both the life and behavioural sciences.

The institute has a comprehensive range of expertise at its disposal, which enables it to investigate cognitive, psychological, neurobiological, immunological and toxicological factors in the context of the working environment. **The institute conducts its work in four departments (Toxicology, Immunology, Ergonomics, Psychology & Neurosciences). As recommended, collaboration between them has been intensified since the last evaluation, largely by aligning the overall concept with biological processes along the liver-brain-immune axis. The review board welcomes this direction, which should now be pursued further. This will enable IfADo to raise its profile and visibility as an interdisciplinary institute for research on the working environment beyond the individual departments, which are already highly regarded in their respective disciplines.**

### Results

#### *Research*

The institute's research leads to innovative, in many cases outstanding, results that are published in internationally recognised specialist journals. It is good to see that results are increasingly being obtained through cross-institute collaborations and are then also published in interdisciplinary or medical journals.

Highlights of the past years include the discovery of basic principles of physiological as well as molecular mechanisms of liver diseases and hepatotoxicity using state-of-the-art imaging and cell biology methods. IfADo has also developed a simplified method to determine a novel metric for

immune age (IMMAX) as well as a brain stimulation protocol that is capable of inducing and stabilising oscillatory brain activity, which results in enhanced working memory performance. In connection with this, researchers demonstrated the amount of cognitive decline and the time course of attentional focusing during task interruption.

### *Research infrastructures*

The institute has excellent infrastructure, which is also used by collaboration partners, for instance within the *EU-ToxRisk* project. In particular, the new 3 Tesla human magnetic resonance imaging (MRI) scanner that was installed in 2020 as part of a strategic expansion (see chapter 3), is used intensively in collaborative projects, including with partners from Klinikum Dortmund, within the Collaborative Research Centre *SFB 1280* on Extinction Learning, and with the Leibniz Institute for Resilience Research in Mainz.

In 2016, the institute launched the Dortmund Vital Study, a longitudinal cohort study that is successfully coordinated by the networking group “Aging” within the Department of Ergonomics as a cooperative project involving all IfADo departments. The aim is to explore the health and psychological state of employees between the ages of 20 and 70 years, with a special emphasis on influences of the liver, brain and immune system on healthy cognitive aging. So far, more than 600 participants have been investigated using neuropsychological tests, biological samples, genetics, and an extended neurocognitive evaluation. Already in the second interval of the longitudinal study, valuable data has been collected. The study has now reached a high level of visibility.

### *Transfer*

IfADo contributes its expertise to important committees that regulate and standardise guidelines and legislation. Two leading scientists from the Department of Toxicology are members of the Permanent DFG-Senate Commissions for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK-Commission) and Food Safety (SKLM). Since the last evaluation, IfADo has contributed its expertise to a large number of substance assessments.

In the last evaluation, the institute was encouraged to make greater use of the high practical relevance of its research by registering patents and collaborating with partners in industry. IfADo appeared reluctant in light of its involvement in the above-mentioned MAK Commission, which it believed could lead to conflicts of interest. In the view of the review board, however, this would only concern collaborations in the field of toxicology. In this regard, it is good to see that IfADo increasingly collaborates with businesses in joint research projects such as the EU projects *FELICE*, *sustAGE* and *Neurotwin*. In addition, two patents were registered in 2022.

It is worth highlighting that the institute is actively involved in researching alternatives to animal experiments. For instance, it has developed cell culture systems of the liver that are widely used in routine toxicological tests. This research won the Federal Ministry of Food and Agriculture’s Animal Welfare Research Prize.

In terms of science communication, it is particularly noteworthy that the head of the Department of Immunology was very active and visible in the media during the COVID-19 pandemic.

### 3. Changes and planning

#### Development since the previous evaluation

The institute has made very good progress since the last evaluation. Additional institutional funding was used to set up a central unit for Systems Modelling and to expand the equipment infrastructure as well as the personnel capacity in all departments. The new equipment has been used very successfully to strengthen interdepartmental collaboration. The institute has established new research pipelines that allow for studying the health effects of work-related factors on different levels, from cell to organ and organism, including animal models and humans. These models are employed very successfully in two studies where, among others, the factors that affect health and ageing were investigated: The *Mice-to-Men* project investigates molecular biological aspects, brain physiology and the behaviour of animals, while the Dortmund Vital Study investigates human participants.

IfADo makes very effective use of junior research groups (JRGs) to establish new topics at the institute. Six JRGs have been consolidated into regular research groups since the last evaluation (see chapter 5 for details of this process). In 2020 and 2022, another two groups have been established that enrich the IfADo topic portfolio. These have very good prospects as well; one of the two leaders has already been appointed to a W2 professorship with TU Dortmund.

#### Strategic work planning for the coming years

The institute plans to expand knowledge on the multidimensional association of work-related strain and various diseases that impact work ability. This means that in future the research will increasingly focus on differences between individuals (e.g. in terms of age and sex as well as cognitive, genetic or psychological factors) and their lifestyles (e.g. exercise and nutrition). The data from the longitudinal Dortmund Vital Study are extremely relevant in this context.

#### Planning for additional funds deriving from institutional funding

**IfADo intends to apply for additional institutional funding from the federal and *Länder* governments (*Sondertatbestand*). The aim is to expand its precision imaging facilities and to establish big data integration methods for understanding the pathomechanisms of work- and lifestyle-related diseases and their prevention. From 2027 onwards, additional annual funding of €1.9m (plus €0.42m from own funds) is to be used for technical infrastructure and to finance 12 additional employees. The plans also include common equipment, with a necessary upgrade to the MRI scanner that was purchased during the last strategic expansion, as well as a new high-performance computing cluster.**

**Specifically, the institute would like to pursue two research topics:**

- **It plans to investigate metabolic dysfunction-associated steatotic liver disease (MASLD), a disease caused in part by work-related lifestyle factors (e.g. stress-related malnutrition and lack of exercise linked to sedentary occupations). The molecular research addresses aspects at the cellular and organ level in *in-vitro* and animal models, the results of which are then implemented in studies in humans, including patients. The work is to be carried out within the framework of a Tissue Cartography research**

**platform. These plans, which are well thought through, innovative and will advance research in the field, are expressly endorsed.**

- **The review board also supports the institute’s plan to study stress-related contributions to burnout and depression in affected individuals. These important topics are a suitable addition to the institute’s research spectrum. However, the plans aiming to set up a “clinical hub” at IfADo need to be substantiated with a detailed staffing plan. In particular, the institute should clarify which phases of clinical trials can be carried out at the institute. The project name “clinical hub” should be reconsidered and then be adjusted to reflect this.**

## **4. Controlling and quality management**

### **Facilities, equipment and funding**

Between 2020 and 2022, IfADo’s institutional funding totalled on average €14.4m p.a., which is adequate to cover its current portfolio of activities. Thanks to additional funding from the federal and *Länder* governments (*Sondertatbestand*) for the installation of its central unit for Systems Modelling, the institute’s core budget has grown considerably since the last evaluation. The institute also received temporary funds to establish the associated equipment platform. Work on this is not yet fully completed. As a result, IfADo currently has access to significant self-managed institutional funding carried over from previous years (*Selbstbewirtschaftungsmittel*). This is likely to be used up in the foreseeable future, as the institute has explained.

Third-party funding has also increased in absolute terms since the last evaluation and is now on average €4m p.a. (2020–2022). However, the simultaneous growth in institutional funding means that third-party funding’s share of the budget for ongoing activities is similar to what it was seven years ago (an annual average of 21% in 2020–2022 compared with 23% in 2013–2015). As before, grants from the federal government (mainly the Federal Ministry of Education and Research, BMBF) and from the *Land* government of North Rhine-Westphalia (NRW) play an important role. It is good to see that the institute also secures significant funding through competitive procedures, such as those run by the DFG. For instance, IfADo is involved in the Collaborative Research Centre on Extinction Learning at Ruhr University Bochum (*SFB 1280*) through three sub-projects.

IfADo has modern laboratories and outstanding equipment that has been significantly expanded since the last evaluation. Besides a 3T human magnetic resonance imaging scanner, it uses non-invasive brain stimulation labs for imaging studies. Furthermore, the institute has a variety of imaging devices, a virtual and augmented reality lab, labs for EEG and EMG measurements and a cold pressor laboratory. Two central units provide outstanding support for the research activities. It is good to see that the times when the MRI scanner can be used have now been extended from seven to ten hours a day following the set-up phase. To relieve pressure on this scanner, measurements on animal models should be carried out in an MRI scanner for animals.

**The institute’s premises are appropriate. However, the air conditioning in some laboratories is in urgent need of improvement, since it is not possible to work in them on hot summer days.** These kinds of structural improvements are difficult to carry out because of the institute’s tenant status.

**IfADo's digital infrastructure was strengthened when the central unit for Systems Modelling was set up and, as recommended, a research data management system was introduced. However, the number of people working in IT has decreased, despite increased requirements. The institute needs to expand its personnel capacities in IT again in the future.**

### **Organisational and operational structure**

IfADo is managed and developed very successfully by a Board of Directors consisting of four scientific members and one commercial director. The scientific members of the Board are the department heads and each lead a research group within their department. They are recruited as professors in joint appointment procedures with TU Dortmund.

The members of the Board elect a spokesperson, who is appointed by the Board of Trustees for five years. In 2023, the post of board spokesperson was transferred from the head of the Department of Toxicology to the head of the Department of Ergonomics.

### **Quality management**

IfADo has implemented appropriate quality assurance measures. It follows the standards of good scientific practice as laid down in the Leibniz Association and DFG guidelines. The employees elect two ombudspersons. In addition, the institute has set up an ethics committee that accompanies the research activities.

The publications concept is justifiably focused primarily on publications in internationally visible journals. About two-thirds of the peer-reviewed articles appear as open access. IfADo is encouraged to increase this share. It is good to see that research data are now recorded, integrated and managed in electronic lab books.

The institute allocates some of its funds through a performance-based funding allocation system. It is good to see that, in line with a recommendation from the last evaluation, the proportion of funds distributed in this way has been increased from 1.5% to 4.4% (around €600k) of the core budget.

### **Quality management by advisory boards and supervisory board**

The Board of Trustees performs its duties as a supervisory body, as set out in the statutes, in a convincing manner.

IfADo's Scientific Advisory Board meets once a year. At the midpoint between two external evaluations, it carries out an audit, as required for Leibniz institutions. The Scientific Advisory Board should record recommended actions clearly and concisely and direct them to defined recipients. Care should also be taken to ensure a critical distance between the members of the Scientific Advisory Board and the institute. Most of the SAB members publish articles with members of the institute, some of them to a considerable extent. **In order to ensure the independence of the Scientific Advisory Board (SAB) and good scientific practice, researchers who cooperate closely with IfADo should not be members of the SAB. If members of the SAB enter into collaborations with the institute, they should resign from the board.**

**Only two of the ten members of the SAB come from institutions outside of Germany. IfADo should use upcoming appointments to increase the number of members coming from abroad.**

**As is usual at Leibniz institutes, the IfADo statutes allow board members to be re-elected for a second term. In addition, at IfADo, a further re-election is possible in particularly justified cases. This option should be removed and the statutes should be amended accordingly.**

## **5. Human Resources**

In terms of personnel, the institute has grown considerably since the last evaluation, in large part due to the increase in institutional funding (see chapter 4). The personnel increases occurred primarily in research and scientific services (from 75 to 108, i.e. +44%). By contrast, personnel numbers in the science support area fell (from 93 to 79, i.e. -15%). IfADo should keep a close eye on this trend.

At 31 December 2022, 35% of the employees in research and scientific services came from abroad. In view of this pleasingly high proportion, it is good to see that their interests have been supported by two diversity officers since 2022. **To simplify the onboarding process for new employees from abroad, language support services should be expanded and administrative support should be provided in English. All employees should be given access to language courses for this purpose.**

### **Senior scientific and administrative positions**

The scientific members of the Board of Directors are the four department heads. It is good to see that the upcoming retirement of the head of the Department of Ergonomics in 2030, who is currently spokesperson of the Board of Directors, is already part of the institute's strategic planning.

The department heads are appointed to professorships (W3, C4) in a joint procedure with TU Dortmund (TUD). The research group leaders include a jointly appointed W2 professor, and four others hold adjunct (*außerplanmäßige*) professorships at local universities (TUD, RUB, University of Duisburg-Essen).

### **Staff with a doctoral degree**

Among the IfADo employees with a doctoral degree there are 48 postdocs in the first six years following their doctorate. IfADo offers them very good career development opportunities, in part thanks to its excellent scientific infrastructure. In the past few years, two postdocs completed habilitations at IfADo and four researchers were offered professorships at higher education institutions. There are numerous opportunities at the various partner universities (see chapter 6) for postdocs to get involved in academic teaching. To make these opportunities more easily accessible to early career researchers, the institute could provide an overview of the relevant information in one place.

IfADo makes very effective use of the option to set up junior research groups (JRG), including from the core budget. Each JRG has at least one position for a doctoral researcher, as well as material resources. **The JRGs are evaluated by the Scientific Advisory Board, and can be**

converted into regular research groups on its recommendation. This has happened six times since the last evaluation, and two new JRGs have been set up. It is good to see that, through this kind of tenure track system, IfADo offers scientists long-term career prospects at the institute. To ensure greater transparency in this process, the conditions, criteria and decision-making paths should be documented and made accessible to all employees.

### **Doctoral candidates**

At the end of 2022, 36 doctoral researchers were employed at IfADo. They are closely integrated in the work of the departments where they receive very good supervision. They take part in the relevant colloquia and seminars. **The supervision concept for doctoral researchers includes a supervision agreement signed with a supervisory team consisting of two to three individuals. The supervisory team should be expanded into a thesis advisory committee including scientific advisors from outside of IfADo for all doctoral researchers. This is already possible at the moment, but not yet the rule.**

In 2020–2022, 29 doctorates were completed, with an average duration of four years, which is reasonable. The doctorates are completed either at Ruhr University Bochum or TU Dortmund, depending on the subject area. The doctoral researchers are integrated in the structured programmes at these universities.

### **Science supporting staff**

The institute's support for the professional training of its employees is very good. As part of the staff development concept, the need for further training is raised in annual staff appraisals. Greater care should be taken to ensure that everyone concerned is made aware of the existing opportunities. In addition, English classes should be offered to the science supporting staff, in both the administrative and technical areas (see above).

IfADo's involvement in vocational training is appreciated. At the end of 2022, five apprentices were working at the institute in various professions. Three apprentices completed their training between 2020 and 2022.

### **Equal opportunities and work-life balance**

The gender equality measures are aligned with the relevant Leibniz Association standards and are structured with the help of an equality plan. The gender equality officer and her deputy are released from 20% of their other work for this task. They have a budget to implement measures.

**At the end of 2022, just over half of the employees in the research and scientific services area were women (55 out of 108). However, only three of the 17 research groups (including two junior research groups) were led by women. This is a slight improvement on the situation at the last evaluation, but there are still no women at scientific director level. IfADo is therefore called upon to increase the proportion of women at leadership level. Over the coming years, personnel changes must be used to make improvements in this area.**



The institute offers its staff suitable options to help them balance work and family life and to protect their health, such as flexible working hours, mobile working and support with care work and following longer absences due to ill health.

## 6. Cooperation and environment

IfADo is an affiliate institute of TU Dortmund University (TUD) and five of its senior scientists hold professorships there; three others are associated with the university through adjunct (*außerplanmäßige*) professorships or as private lecturers. The productivity of the collaboration is visible in e.g. the DFG-funded Research Training Group on Biostatistical Methods for High-Dimensional Data in Toxicology, in which the Leibniz Research Institute for Environmental Medicine in Düsseldorf (IUF) is also involved.

The institute's collaboration with Ruhr University Bochum (RUB) is also very fruitful. Five senior scientists have now been co-opted by the Faculty of Psychology. Worth highlighting here is the collaboration within the DFG-funded Collaborative Research Center *SFB 1280* on Extinction Learning (2017–2025) under the leadership of RUB.

IfADo researchers are heavily involved in teaching at local higher education institutions and in large collaborative research networks: the BMBF-funded *LiSyM-Cancer Network* (Liver Systems Medicine against Cancer) and the *German Centre for Mental Health* (DZPG) in Bochum, which has been under construction since May 2023, as well as several EU projects.

Within the Leibniz Association, it is worth highlighting the institute's involvement in the Leibniz Research Network on Immune-Mediated Diseases, for which the spokesperson comes from IfADo. Together with the Federal Institute for Occupational Safety and Health (BAuA), the Institute of Prevention and Occupational Medicine (IPA, RUB) and other more application-oriented institutions, IfADo forms a productive cluster of labour research in the Ruhr region.

## 7. Subdivisions of IfADo

### Department of Toxicology

(51.3 FTE, of whom 25.5 FTE research and scientific services staff, 8.8 FTE doctoral candidates, and 17 FTE service staff)

The department conducts very successful research on the physiology and pathophysiology of the liver as well as the connection to the kidneys, immune system and nervous system. The focus is on self-organising principles of cells, organs and organisms, with the goal of studying mechanisms of chemical toxicity and pathomechanisms of diseases.

Results worth highlighting include studies that describe dysfunctions at the blood-bile barrier and identify ways of counteracting these with drugs. Other noteworthy results were achieved in the research on basic neurophysiological processes, which can translate very well into practical application (see below). Very good results were also presented on the role of metabolic networks in carcinogenesis and on the influence of fatty liver disease on the pathophysiology of the kidneys. The department is extremely successful at developing and applying microscopy-based and intravital imaging techniques. These highly innovative methods are combined with molecular and

cell biology approaches, leading to outstanding results in the investigation of liver disease, some of which are even of direct clinical relevance.

Since the last evaluation, the department has developed extremely well and has also grown considerably as a result of additional institutional funding. Successful junior groups were converted into more permanent regular research groups, enabling the institute to retain the expertise of the group leaders. Great potential is also seen in a new Junior Research Group set up in 2022. It is studying the differentiation of stem cells in mature liver and nerve cells for application in animal-free *in vitro* systems for toxicity tests.

The department is heavily involved in risk assessments of chemicals in the workplace – expertise that it contributes to the relevant commissions and committees for workplace toxicology to help establish guidelines and legislation. This work involves providing large volumes of data and developing improved test systems. It leads to a high level of visibility for the department.

Revenue from third-party funding, mainly from the federal government, is very high. The research findings are published in highly visible international journals. The department is rated “very good to excellent”.

### **Department of Immunology**

(14.3 FTE, of whom 4.5 FTE research and scientific services staff, 5.2 FTE doctoral candidates, and 4.6 FTE service staff)

The department conducts impressive basic and applied research on the function and regulation of immune cells. The focus is on the role of the immune system in work-related diseases and in conditions which affect the ability to work. For this purpose, the department develops its own methods. Particularly noteworthy is a simplified method to determine a novel metric for immune age (termed IMMAX) that was used in the Dortmund Vital Study.

Basic research in this department covers topics in the fields of immunology and cell biology, e.g. the influence of age, sex and work conditions on the immune system. Through these, the department aims to understand natural killer (NK) cells and works at the border of the innate and adaptive immune system. In its more applied research, the department investigates a broad spectrum of topics, including widespread conditions like osteoporosis and pain. It is good to see that the department cultivates close collaborations with academic and clinical partners, so that results can be translated into clinical practice.

Since the last evaluation, one junior research group in this department has been converted into a more permanent regular research group, thereby firmly establishing the associated neuroimmunological expertise at the institute. The review board appreciates the plan to establish a new junior research group with a focus on microbiome research. This focus area is promising because of the close connection of the immune system with the liver and the intestine. To further strengthen the liver-brain-immune axis and collaboration with the other departments, a scientist with expertise in the field of liver research should be appointed as group leader.

The department head assumed a lot of responsibility for knowledge transfer to the general public during the COVID-19 pandemic. Against this background it is plausible that third-party funding revenue has been lower this time than in the last evaluation. The department's results are

regularly published in highly visible international outlets. The department is rated “very good to excellent”.

### **Department of Ergonomics**

(43.5 FTE, of whom 18.6 FTE research and scientific services staff, 6.2 FTE doctoral candidates, and 18.8 FTE service staff)

The department consists of interconnected thematic areas covering the whole research continuum from fundamental aspects of human information processing and method development to designing work environments in the real world. The studies are conducted in close internal collaboration, with most of the scientists working in more than one sub-unit. The review board appreciates this comprehensive approach that spans from basic research to application in the workplace.

The department’s work is extremely relevant in the workplace context. It includes studies on mechanisms of how information is received and stored and how this is influenced by work-related factors. These studies led to very good results on the influence of task interruptions on attentional control as well as on the transfer of information from the working memory to the long-term memory. The department is very successful at developing new measurement methods, e.g. using mobile EEG devices. These techniques are used extremely profitably, with high personnel input, to measure mental stress in the workplace and its effect on information processing, as well as in the field of cognitive neuroergonomics. Cognitive neuroergonomics connects the basic and application-oriented research of the department and has been developed coherently since the last evaluation by merging the work of two units. The department also conducts successful research on the mechanisms of cognitive ageing and their influencing factors, in particular in the networking group “Aging”, which coordinates the Dortmund Vital Study. It is worth highlighting that applied research is also carried out in joint projects with industry partners.

The department secures high levels of third-party funding, largely from the federal and *Länder* governments. Results are very well published, mainly in application-oriented journals, including workplace-related publications. The department is rated “very good”.

### **Department of Psychology & Neurosciences**

(24.4 FTE, of whom 13.8 FTE research and scientific services staff, 4.4 FTE doctoral candidates, and 6.2 FTE service staff)

The department is very successful at investigating psychological processes, their biological foundations and influencing factors for employee work performance and well-being to improve working conditions. Highlights include studies on cognitive processes during task switching, and extinction learning, which encompasses the substitution of updated knowledge for information that is no longer useful. These results are based on brain stimulation tools developed in-house that allow targeted modulation of brain physiology to alter psychological processes in health and disease. Other studies focus on chronobiology-dependent differences of brain physiology and the influence of sleep deprivation, which are extremely important in the context of shift work.

The department has made very good progress since the last evaluation and the number of staff has grown. This was facilitated by the additional funds to establish the central unit for Systems Modelling and by third-party funding, which almost doubled. In 2020, a junior research group was established to study inter-individual differences in human factors in relation to work, e.g. general cognitive and learning ability. For this purpose, the group set up and maintains the 3T magnetic resonance imaging (MRI) platform, which is essential for the research conducted by the whole institute. It is noteworthy that different methodologies are combined using behavioural data, neurogenetic techniques and modern microstructural neuroimaging, e.g. EEG and eye-tracker measurements inside the MRI device. The department makes an important contribution to the Dortmund Vital Study by providing multi-modal MRI brain and liver scans.

The department is very well connected within the scientific community and in networks, e.g. the DFG-funded Collaborative Research Center *SFB 1280* on Extinction Learning. The results are regularly published in internationally recognised journals. The department is rated “very good to excellent”.

## **8. Handling of recommendations of the last external evaluation**

IfADo has successfully addressed most of the recommendations made by the Leibniz Association Senate in 2017 (see Status Report, p. A-19f). The recommendations concerning the expansion of the strategic linkages across all its departments (recommendation 2) and the proportion of women at leadership level (recommendation 8) still apply.

## Appendix

### 1. Review board

*Chair (Member of the Leibniz Senate Evaluation Committee)*

**Ulf Müller-Ladner**

Chair for Internal Medicine and Rheumatology, Justus-Liebig University Giessen, Campus Kerckhoff, Bad Nauheim

*Deputy Chair (Member of the Leibniz Senate Evaluation Committee)*

[cancellation at short notice]

*Reviewers*

**Ulrich Beuers**

Department of Gastroenterology and Hepatology, Amsterdam University Medical Center, The Netherlands

**Monique Breteler**

German Center for Neurodegenerative Diseases, Bonn

**Barbara Deml**

Institute of Human and Industrial Engineering (ifab), Karlsruhe Institute of Technology

**Thomas Huser**

Department of Physics, Bielefeld University

**Hans-Gustaf Ljunggren**

Center for Infectious Medicine, Karolinska University Hospital Huddinge, Stockholm, Sweden

**Olga Seifert**

Department of Endocrinology, Nephrology & Rheumatology, Leipzig University Hospital

**Hartwig R. Siebner**

Department of Clinical Medicine, University of Copenhagen, Denmark

**Martin F. Wilks**

Swiss Centre for Applied Human Toxicology, University of Basel, Switzerland

**Ulrike Zimmer**

Professor for Biological Psychology and Research Methods, Medical School Hamburg

*Representative of the federal government*

[cancellation at short notice]

*Representative of the Länder governments*

[cancellation at short notice]

7 August 2024

**Annex C: Statement of the Institution on the Evaluation Report**

**Leibniz Research Centre for Working Environment and  
Human Factors, Dortmund (IfADo)**

The IfADo thanks the review board for their thorough and substantive evaluation of the Institute and for their insightful comments. We also express our thanks to the team of the evaluation department for their excellent support during the process. Together with our scientific advisory board and our board of trustees we will implement the recommendations of the evaluation report.

The IfADo thanks the reviewers for acknowledging the intensified collaboration between our four departments by aligning our overall concept with biological processes along the liver-brain-immune axis. As recommended, we plan to pursue this direction further with our application for additional institutional funding (Sondertatbestand). Our approach is designed to generate interdisciplinary datasets in humans, laboratory animals and cell systems related to work and lifestyle-related diseases. We thank the reviewers for the strong recommendation on research focus 1 (Tissue Cartography) for integration of multimodal tissue and patient data into a method-agnostic computational inference framework. We were also happy to learn that the review board supports research focus 2, which will integrate immunological, electrophysiological and neuroimaging data of “at-risk” populations going beyond “standard clinical testing”. Here, the integration is more on the level of the entire human organism, but similar computational tools will be used to foster mechanistic insights with a special focus on interindividual differences. We agree that the term ‘clinical hub’ might suggest the routine execution of clinical trials (Phase I to III) here at the IfADo which is not the aim of research focus 2. Accordingly, the term ‘clinical hub’ will be changed in the final application and a detailed staffing plan will be provided.

A suggestion from the Department of Toxicology refers to the subdivisions (synonym: project groups) described in the evaluation dossier that also presented their work individually to the reviewers. The present evaluation report refers only to the departments, but it would be appreciated if the reviewers’ comments for the different project groups (subdivisions) would also be given, especially since the actual research work is performed at the level of project groups and collaborations between them. Also in the previous evaluations, feedback was available for the individual project groups, which would be invaluable especially if there are specific issues that would allow further optimization.