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Editorial

Dear Readers,

We begin this edition of the newsletter with a report by Lena Keller, Franzis Preckel, and Martin Brunner on their large new project, which will focus on gender differences in education. They draw on an example from astronomy to illustrate their approach to the topic, namely the telescopes used to detect black holes. A selection of images are distributed thoughout this edition of the newsletter.

UZH and MPIB alumnae Wenke Möhring and Sabine Schäfer met at a conference of the German Psychological Society (DGPs) a few years ago and started talking about their common research interests. Only some time later did they realize that they had both been LIFE fellows (in non-overlapping cohorts). Here, they present their collaborative research on dual tasking in childhood and adulthood.

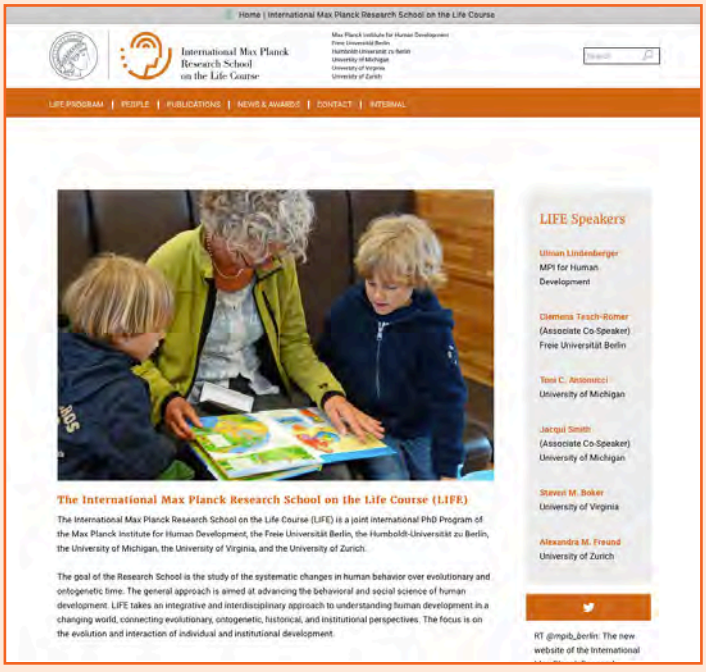
Recent UZH alumna Lea Mörsdorf then provides an interesting perspective on the research process in psychological science. Going beyond the current calls for replication and preregistration, she turns to the important role of testable theory and also considers the ways in which researchers' own subjectivity can influence their studies.

We continue with the announcement of the winner of the LIFE Outstanding Alumni Award 2020: UM alumna Jessica Bernard. Congratulations!

Then come the fellows' abstracts for this year's Fall Academy, hosted virtually in Berlin in October. As always, they cover a remarkably broad range of lifespan topics. UM faculty Brenda Volling has interesting answers to our 10 questions, emphasizing the important roles that fathers and siblings play in development. We then belatedly introduce MPIB alumnus Oliver Huxhold, now at DZA, who joined the Berlin LIFE faculty in the summer. As usual we close with the latest publications and the LIFE news.

Special thanks to all contributors! And on behalf of LIFE Berlin at MPIB, I wish you all a happy and healthy holiday season!

Julia Delius



The LIFE website has been relaunched!

Take a look at https://www.imprs-life.mpg.de to see what is on offer there. A new feature under "News & Awards" is called *LIFE Highlights*, where selected newsletter articles will be made available, starting with the one in memory of the last participant in the Berlin Aging Study from the April issue. Perhaps you want to nominate an article from this edition?

We are still hoping for some more feedback from alumni to ensure that the information provided about them on their profiles is up-to-date. If you haven't done so yet, please take a look at your profile to make sure the information about you is correct. We would like to be able to include more photos of alumni as well!

Contact delius@mpib-berlin.mpg.de if you'd like anything to be changed, corrected, or added!

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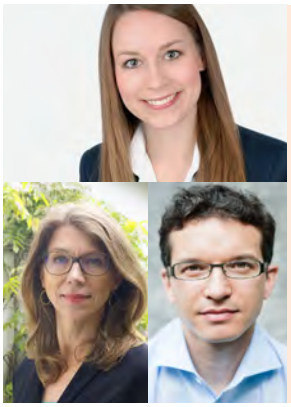
Reminder

Fellows, alumni, and faculty, please keep us informed about your LIFE-relevant news (e.g., awards, career moves)! Fellows and alumni, please check that your web profiles are up-to-date—they are often the first thing that pops up when your name is googled! Send your updates to delius@mpib-berlin.mpg.de

LIFE Website: www.imprs-life.mpg.de



Precision is Key: What Gender Differences in Education and Supermassive Black Holes Have in Common

Lena Keller, LIFE alumna, University of Potsdam, Franzis Preckel, University of Trier, & Martin Brunner, LIFE faculty, University of Potsdam

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Together with two colleagues, Reinhard Genzel, director of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, was awarded this year's Nobel Prize in Physics "for their discoveries about one of the most exotic phenomena in the universe, the black hole" (Nobel Media AB, 2020). At his press conference just a couple of weeks ago, Genzel emphasized the importance of reliable measurement and the access to state-of-the-art tools—in his case the world's largest telescopes—for their groundbreaking findings (see images throughout the newsletter). By using these enormous telescopes and developing techniques to correct the image distorted by interstellar gas and dust, Genzel and his co-awardee, Andrea Ghez, were able to detect deviations in the orbit of the stars at the center of the Milky Way. These deviations are yet the most convincing evidence for a supermassive black hole in our galaxy (The Royal Swedish Academy of Sciences, 2020).

Reliable measurement and the use of state-of-the-art tools are not only important in physics or astronomy, but also in educational and psychological research, such as in the case of gender differences in students' achievement and achievement motivation. In the next three years, we—Martin Brunner (University of Potsdam; PI), Lena Keller (University of Potsdam), and Franzis Preckel (University of Trier; Co-PI)—will conduct the research project BIG-GENDER: Big data meta-analyses of gender differences in students' achievement and achievement motivation drawing on large-scale assessments funded by the Deutsche Forschungsgemeinschaft (DFG). In this project, we aim at providing reliable knowledge on gender differences in students' achievement, achievement profiles, and achievement motivation by using the best "telescope" available: individual participant data (IPD) meta-analyses in combination with data from international large-scale assessments. In the following, we present this line of research.

Why do we focus our "telescope" on gender differences in education?

As in astronomy, there seem to be "black holes" in educational settings that affect male and female students' educational trajectories. For example, in 2016, across all member states of the European Union (Eurostat, n.d.), the percentage of male students was 74% among all students in the fields of engineering, manufacturing, and construction-related studies. By contrast, the percentage of women was 71% among all students in fields related to health and welfare, and 78% in the field of education. Which "black hole" (or are there several?) leads to these gender differences? There are, of course, many answers to this question. However, any scientific and political discourse on gender differences in educational contexts (and beyond) requires a reliable body of empirical knowledge on the nature, size, variability, and moderating factors of these differences. This knowledge is highly relevant for at least three reasons: It can be used (a) to learn about gender differences before university entry as plausible antecedents of still existing gender gaps in academic fields, (b) to provide scientific evidence that can help dispel persistent stereotypes (e.g., that only boys can excel in mathematics) that may discourage girls from pursuing careers in science, technology, engineering, and mathematics (STEM), and (c) to identify target points for evidence-based decision making in educational policy (e.g., boys from families with low socioeconomic status [SES]).

What did previous "telescope pictures" tell us about gender differences in education?

In the past few decades, much research has been devoted to studying gender differences in psychology and education. Whereas early scientists attested women to be intellectually deficient compared to men and motivated mainly by maternal instinct (Shields, 1975), current psychological research suggests that women and men are very similar to each other and differ in only a few areas.

In a seminal synthesis of 46 meta-analyses, Hyde (2005) showed that "males and females are alike on most—but not all—psychological variables" (Hyde, 2005, p. 590). Of 124 studied effect sizes for gender differences, 78% were small or very close to 0, including academic achievement and a range of motivational variables. Based on this finding, Hyde (2005) put forward the gender similarities hypothesis, which contradicted popular media reports that emphasized differences between the genders (i.e., "women are from Venus, men are from Mars"). These findings have been extended and replicated in a more recent synthesis of psychological gender differences (Zell et al., 2015).

In educational contexts, however, female students seem to be more successful than male students at first glance. Indeed, recent research shows that female students have caught up with or even surpassed male students with regard to their performance on school-based assessments (Voyer & Voyer, 2014). Overall, there are more women (59%) than men who graduate with a Bachelor's degree across all member states of the European Union (Eurostat, 2020; for similar results in the US, see Meece & Askew, 2012). However, if we focus on the results of achievement tests and students' self-reported achievement motivation rather than on grades, a slightly different picture emerges. Female and male students' achievement in standardized tests and their self-reported achievement motivation in mathematics, reading, and science are largely similar (see Table 1). Yet, gender differences are found in specific domains, such as females' and males' interest in engineering (d = 0.83 to 1.11; Su et al., 2009; Su & Rounds, 2015), engineering technology (d = 0.89; Su & Rounds, 2015), mechanics and electronics (d = 1.21; Su & Rounds, 2015), as well as in their enjoyment of reading (d = –0.67; OECD, 2010; for further details, see Keller, 2020).[1]

More differentiated "telescope pictures" of gender differences have been taken by studies that also looked at female and male students' academic strengths and weaknesses. To this end, these studies examined achievement profiles. Achievement profiles can be calculated, for example, by subtracting a student's test score in one domain from the same student's test score in another domain. Interestingly, studies that investigated gender differences in students' achievement profiles showed that male students demonstrated stronger math achievement tilts than female students, whereas female students demonstrated stronger verbal achievement tilts than their male counterparts in school subjects at the age of 16 (Dekhtyar et al., 2018) and in college entrance exams (Coyle et al., 2014, 2015).

Studies on gender differences have addressed not only mean-level differences, but also gender differences in variability. The results on gender differences in variability have led to the development of the greater male variability hypothesis (Ellis, 1894). Its descriptive part predicts that males will show greater variability in (psychological) constructs. The explanatory part of the hypothesis claims that

[1] Positive values indicate an advantage of boys/men, negative values an advantage of girls/women.

Table 1. Proportion of effect sizes (in %) for gender differences in achievement and achievement motivation in mathematics, reading, and science that are negligible, small, moderate, large, or very large (obtained from meta-analyses and large-scale studies; see Keller et al., 2020). Percentage of effect sizes in favor of females/males in parentheses.

	Achievement			Achievement motivation		
Magnitude	**Math[a]**	**Reading[b]**	**Science[c]**	**Math[d]**	**Reading[e]**	**Science[f]**
No gender differences	0	5	0	6	0	0
Negligible	52 (29/71)	33 (71/29)	23 (33/67)	17 (50/50)	0	35 (11/89)
Small	48 (0/100)	57 (100/0)	46 (0/100)	72 (31/69)	50 (100/0)	27 (0/100)
Moderate	0	5 (100/0)	31 (0/100)	6 (0/100)	33 (100/0)	23 (17/83)
Large	0	0	0	0	17 (100/0)	8 (0/100)
Very large	0	0	0	0	0	8 (0/100)

Note. Figures may not add up to 100% because of rounding. No gender differences: d = 0.00, negligible: 0.00 < $|d|$ ≤ 0.10, small: 0.10 < $|d|$ ≤ 0.35, moderate: 0.35 < $|d|$ ≤ 0.65, very large: $|d|$ > 1.00; benchmarks by Hyde (2005). k = Number of effect sizes, n = number of studies.

[a] k = 27 (based on 1905), n = 12 [b] k = 21 (based on 1008), n = 12 [c] k = 13 (based on 1264), n = 7
[d] k = 36 (based on 1258), n = 10 [e] k = 6 (based on 201), n = 5 [f] k = 26 (based on 847), n = 7

gender differences in variability have a biological origin. This assumption has caused much (scientific) debate as innate aptitudes were thought to explain the greater number of outstanding scientific accomplishments by men than by women (Shields, 1982). The greater male variability hypothesis has important implications for gender differences in the lower tail (e.g., bottom 10%) and upper tail (e.g., top 5%) of the distribution of a certain target construct. Although mean differences in a construct may be small or negligible, greater variability in male students implies that they may be overrepresented in the lower and/or upper tail of the distribution. Indeed, empirical findings support the descriptive part of the greater male variability hypothesis. In many representative U.S. samples (Feingold, 1992; Hedges & Nowell, 1995) as well as in samples from international large-scale assessments (Baye & Monseur, 2016; Gray et al., 2019), male students have shown greater variability than female students in different achievement domains.

Better and bigger "telescopes" for research on gender differences

As Genzel emphasized in his press conference, reliable and precise measurement and state-of-the-art methods are key to valuable scientific contributions. Accordingly, Genzel and his colleague, Ghez, put effort in building *bigger* telescopes and made them *better* by equipping them with thin extra mirrors to compensates for the air's turbulence and to correct the distorted image (The Royal Swedish Academy of Sciences, 2020). Although we seem to know quite a lot about gender differences in education, the "telescopes" to examine gender differences in education can be also improved by using better research synthesis methods and bigger databases with reliable data covering the full spectrum of gender differences and similarities. In the following, we will explain this in greater detail.

Better "telescopes": Examining gender differences by using state-of-the-art research synthesis methods

Research synthesis methods, such as meta-analyses, are particularly valuable for the estimation of gender differences because they evaluate the magnitude, consistency, replicability, and variability of findings, and explore moderators that might contribute to the presence or absence of gender differences (e.g., Eagly, 2013; Hyde, 2014). In traditional meta-analyses, data are synthesized on an aggregate study level obtained from study publications or study authors (e.g., an effect size and a standard error or confidence interval). More recently, the use of meta-analysis has been extended to IPD synthesis (Stewart & Parmar, 1993). Compared with traditional meta-analyses, IPD meta-analysis adds data to the analyses at the participant level (Riley et al., 2010). Thus, IPD meta-analysis involves obtaining and then synthesizing raw data for the individual participants. Although IPD meta-analysis has been described as a gold-standard method of meta-analysis for quite some time in the biomedical sciences (Stewart & Tierney, 2002), it has only recently entered the field of psychology and education (Roisman & van IJzendoorn, 2018).

IPD meta-analysis has several advantages over traditional meta-analyses (Cooper & Patall, 2009; Riley et al., 2010). Two relevant advantages for our research project are the reduction of method heterogeneity between studies and the increased number of analytic options. Method heterogeneity between studies (e.g., how the target constructs were measured, how the sample for the analyses was defined, and how missing data were treated in the original studies included in the meta-analysis) is a major biasing factor in traditional meta-analyses. It leads to unwanted heterogeneity between studies, which in turn reduces the precision with which gender differences can be estimated. Method heterogeneity is minimized by applying the same inclusion and exclusion criteria across studies and synthesizing the data according to a standardized analysis protocol. Furthermore, the number of analytic options beyond the focal effect size under study is much larger in IPD meta-analysis because of the access to the raw data. This makes it possible, for example, to analyze how individual characteristics are related to the size of gender differences.

Bigger "telescopes": Examining gender differences by using data from all available international large-scale assessments in education

Many previous meta-analyses and reviews of gender differences are limited in the generalizability of their results because of different sorts of selection biases—for Genzel, the distortion of the telescope image by interstellar gas and dust. For example, single studies that investigate gen-

der differences in education usually collect nonrepresentative data and focus on one geographic region or country (e.g., studies that collect data in one or several high schools in Berlin). Studies that examine gender differences in talented students typically solicit volunteers (e.g., the *Terman Study* or the *Study of Mathematically Precocious Youth*). Furthermore, many meta-analyses only include original studies that were published in English, which additionally limits their generalizability. Other studies that examine gender differences in education draw on national college tests that are taken selectively, such as the SAT (Scholastic Aptitude Test/Scholastic Assessment Test).

Interestingly, in experimental studies, researchers are very aware of the problem of selection bias. That is why they aim at implementing the gold standard to allow for causal conclusions: They randomly assign participants to different experimental conditions. There is also a gold standard to allow for generalizability of results: Drawing a random sample from a well-defined population. However, when it comes to sampling, the negative effects of selection biases on the generalizability of results on gender differences are often either ignored or downplayed. Even though selection biases due to nonrandom samples might be small, they can have important consequences because selection biases can simultaneously affect the means and the variances of any observed distribution. Overall, these sources of bias may have effects that are not negligible compared to the actual gender differences (Hedges & Nowell, 1995). Hence, it is an open question how much we can rely on results on gender differences (as in any other field) based on nonrandom samples.

The good news is that international large-scale assessments provide international, representative, and unselected individual participant data from well-defined populations of students to examine gender differences in education. The largest and most prominent international large-scale assessments are the *Programme for International Student Assessment* (PISA; conducted by the Organisation for Economic Co-operation and Development [OECD]), the *Trends in International Mathematics and Science Study* (TIMSS), and the *Progress in International Reading Literacy Study* (PIRLS; both conducted by the International Association for the Evaluation of Educational Achievement [IEA]; Kirsch et al., 2012).

Even in large-scale assessments, however, the generalizability of gender-specific differences is to some extent limited. This is because participation rates are especially low in low- and lower-middle-income countries. As we showed for PISA, female students have on average less access to formal schooling at the primary, secondary, and tertiary levels of education in countries that did not participate in PISA than in countries that participated (Keller et al., 2020). Thus, it is likely that gender differences would be larger in a more diverse sample. There are two reasons for the lower participation rates in low- and lower-middle-income countries. First, participation in large-scale assessments is associated with high costs and high demands on the assessment infrastructure of a country. Second, the standard PISA, TIMSS, and PIRLS assessments may be too difficult for their students (Lockheed et al., 2015; Mullis & Martin, 2017). Fortunately, efforts have already been made to create less difficult assessments. These have been implemented in the most recent PISA, TIMSS, and PIRLS cycles and have the potential to further improve our gender difference "telescope".

The "telescope" of our project

The main goal of our meta-analytic big data project is to provide highly robust and widely generalizable knowledge on cross-national gender differences in students' achievement and achievement motivation (concerning means and variances). To this end, we are building a new "telescope" to study gender differences by combining IPD meta-analysis with large-scale assessment data. Specifically, we will meta-analyze individual stu-

Figure 1. Countries included in the present project.
Note. Countries that are included are depicted in black, countries that are not included are in white. In some cases, the whole country did not participate (as shown in the figure), but some economic regions participated in some PISA cycles. These are: Beijing-Shanghai-Jiangsu-Guangdong (China; PISA 2015), Tamil Nadu and Himachal Pradesh (India; PISA 2009), Miranda (Venezuela; PISA 2009).

dent data from more than 1,000 representative student samples from 114 different countries/economic regions (total $N > 7$ million; Figure 1) participating in 34 cycles of international large-scale assessments covering the period from 1995 to 2019: TIMSS (Grades 4, 8, and 12), PIRLS (Grade 4), and PISA (15-year-olds), including the less difficult assessments TIMSS Numeracy (Grade 4), PIRLS Literacy (Grade 4), and PISA for Development (15-year-olds). Capitalizing on this wealth of data, we will conduct three domain-specific IPD meta-analyses to examine gender differences (concerning mean levels and variability) in achievement and achievement motivation in mathematics, science, and reading, respectively. We will study several moderator variables, including students' SES to learn how individual characteristics affect the size of gender differences. We also examine how gender differences depend on the selectivity of the sample (e.g., the bottom 10% or the top 5% of the achievement distributions), sociocultural indicators of gender equality, and historical changes. Further, we will conduct one IPD meta-analysis to examine gender differences in achievement and motivational profiles in multiple domains among three groups of top-performing students who belong to the top 5% in mathematics, reading, or science in their respective countries. To sum up, we think that we use the best "telescope" available to provide novel and highly reliable insights into cross-national, temporal, and age-related trends concerning gender differences in the general student population and among top-performing students, as well as on the complex interactions between gender, the selectivity of the sample, SES, and sociocultural indicators of gender equality.

In closing, we do not expect to win the Nobel Prize. But we hope to contribute (a) reliable knowledge to better understand the black hole(s) that lead to gender differences in educational trajectories and (b) to an evidence-based discourse on gender differences in education.

Achievement and achievement motivation are key goals of educational curricula worldwide (OECD, 2015; World Economic Forum, 2015). Student achievement is assumed to be the result of a long-term, cumulative, and domain-specific process of knowledge acquisition (Baumert et al., 2009). Achievement is not only an outcome of learning, but also the result of prior achievement, which pays off in the speed, ease, and quality of continued learning (Baumert et al., 2009). Motivation is assumed to energize and direct individuals' actions (Pintrich, 2003). In achievement-related contexts, motivation is related to motives that let students act in different situations, to beliefs why and how they are doing what they are doing, as well as to students' decisions about how to direct their behaviors (Pintrich, 2003; Weiner, 1992; Wigfield et al., 2006). To this end, achievement motivation comprises different types and qualities of motivation, including needs, drives, goals, aspirations, interests, and affects (Lazowski & Hulleman, 2016). Similar to achievement, achievement motivation can be considered as an outcome of learning (e.g., students' motivation increases or decreases as a consequence of learning successes or failures), but also as a prerequisite for future learning because motivated students are more persistent, learn more, and show a higher level of elaboration (Lazowski & Hulleman, 2016; Pintrich, 2003; Wigfield et al., 2006).

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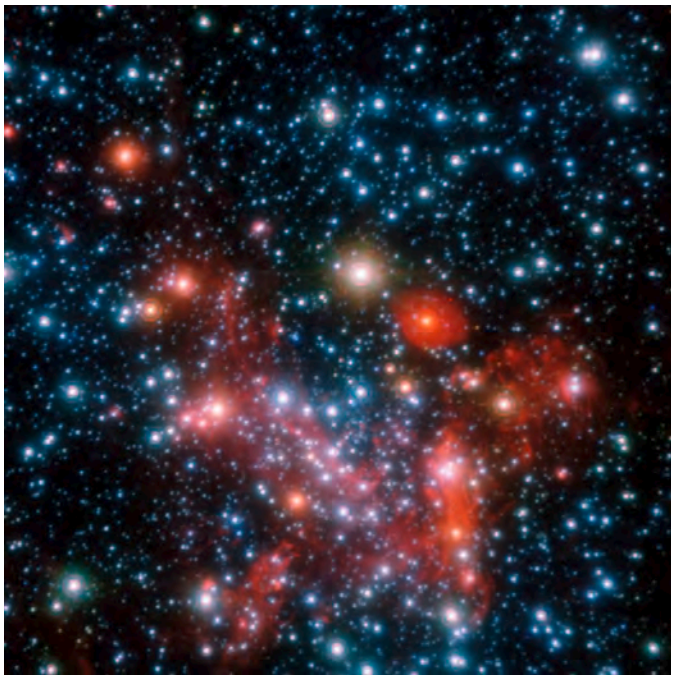

The central parts of our Galaxy, the Milky Way, as observed in the near-infrared with the NACO instrument on the European Southern Observatory's (ESO) Very Large Telescope (VLT). By following the motions of the most central stars over more than 16 years, astronomers were able to determine the mass of the supermassive black hole that lurks there. Source: https://www.eso.org/public/

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The Event Horizon Telescope (EHT)—a planet-scale array of eight ground-based radio telescopes forged through international collaboration—was designed to capture images of a black hole. In coordinated press conferences across the globe, EHT researchers revealed that they succeeded, unveiling the first direct visual evidence of the supermassive black hole in the centre of Messier 87 and its shadow. Source: https://www.eso.org/public/

The Debate «Body Versus Mind» Revisited: Evidence from Motor-Cognitive Dual Tasks in Children and Adults

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Performing two tasks simultaneously saves us a lot of time in daily life. There are multiple situations in which we are dual-tasking such as when we type a message on our mobile phone while walking across the street or when remembering the shopping list while cycling to the grocery store. Combining two tasks inherently belongs to adults' routine behavior; however, it is not restricted to this particular developmental phase. For example, toddlers talk with their mother while walking, and children listen to the instructions of the teacher while coloring a picture. However, even though dual tasking is an integral part of our life, this ability and its development are surprisingly poorly understood. In the present collaborative research project, we aimed to investigate children's and adults' dual tasking and asked participants to walk while solving several concurrent, cognitive tasks. Naturally, there are also other tasks that could be combined in such a dual task. For example, it is possible to combine two cognitive tasks (e.g., Anderson et al., 2011), a different type of motor task and a cognitive task (e.g., balance in Schaefer et al., 2008), or two motor tasks (e.g., Abbruzzese et al., 2014). It is also possible to present the cognitive tasks in different perceptual modalities (e.g., visual vs. auditory) and both tasks at different levels of difficulty. Therefore, multiple combinations of domains, modalities, and difficulty levels can be tested. In the current research project, we used a prototypical cognitive-motor dual task which has been used extensively in previous research (e.g., Krampe et al., 2011; Lindenberger et al., 2000; Schaefer et al., 2008) and which enabled conclusions about how the motor (body) and cognitive system (mind) interact.

What we know thus far (… and what we don't)

In general, in such a dual task, participants are asked to simultaneously perform a cognitive and a motor task (e.g., counting backwards while walking). The underlying assumption is that if two abilities are closely related and require the same underlying resources, a bottleneck results, as visible by an interference effect (Pashler, 1994; see also the cross-talk theory or capacity-sharing theory, Kahneman, 1973; Navon & Miller, 1987; Wickens, 1991). Conversely, if dual-task performance does not differ from performance in a single-task situation, it seems that these two abilities can be executed in parallel without affecting each other, and thus do not seem to share similar resources. These prototypical cognitive-motor dual tasks have often been used with older adults (e.g., Lindenberger et al., 2000; Springer et al., 2006). These adult studies indicated performance decrements in dual-task situations as compared to single-task performance. It was concluded that such dual-task costs emerge because keeping postural control requires higher cognitive processes, with executive functions playing a key role for balance and gait (for reviews, see Woollacott & Shumway-Cook, 2002; Yogev et al., 2008). In addition to these performance decrements, this body of research demonstrated age-related differences in adults' dual-tasking abilities. Older adults showed more difficulties as opposed to younger adults (for a meta-analysis, see Al-Yahya et al., 2011; for a review, see Beurskens & Bock, 2012), probably because older adults' motor performance required more cognitive resources due to decreased physical agility and deteriorations in body strength (e.g., Kressig & Beauchet, 2004).

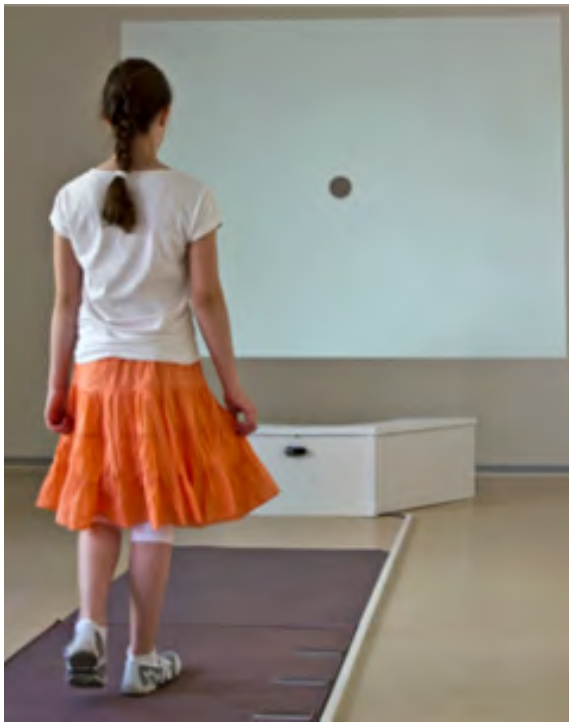
Unfortunately, our knowledge of how children cope with such cognitive-motor dual-task situations is quite limited as dual-task research with children is scarce. Furthermore, it is difficult to generalize findings from adults to children given that executive functions develop considerably across childhood and adolescence (for a review, see Best & Miller, 2010). This lack of research is surprising considering that (i) these investigations would qualify the debate about the involvement of cog-

nitive processes in motor ability, and vice versa, and (ii) inform us how children learn to coordinate two simultaneous tasks. Considering that executive functions show a protracted developmental progression across childhood and adolescence, it seems reasonable to expect that dual tasks are challenging for children. Indeed, some studies investigating children's dual tasking revealed performance decrements similar to findings with older adults (e.g., Abbruzzese et al., 2014; Boonyong et al., 2012; Saxena et al., 2019). However, whereas these latter studies yielded costs, other research has revealed no effects or even improved dual-task performance (Schaefer et al., 2008, 2010), indicating the influence of potential moderating variables and the usage of different prioritization strategies across these studies.

Another question that remains unanswered so far is the developmental progression of cognitive-motor dual tasking across childhood. Two recent reviews provided weak evidence for an improved dual-tasking ability from early to late childhood (Ruffieux et al., 2015; Saxena et al., 2017). Evidence was categorized as weak given the methodological limitations in previous research. For example, sample sizes of some studies were rather low (cf. $N = 10$ children in Abbruzzese et al., 2014). Other studies did not account for individual differences in children's single-task performance (e.g., by computing proportional dual-task costs), or did not equate difficulty levels to each child's performance level in the single task (for an exception, cf. Krampe et al., 2011). These latter aspects are important as they enable one to ascribe differences between age groups to age-related differences in the dual-task ability per se and not to individual differences already found in the single-task performance (for a detailed discussion of this concern, cf. Saxena et al., 2019). Still, when meeting these methodological constraints, some studies found no age-related differences in participants' dual tasking (e.g., Anderson et al., 2011; Saxena et al., 2019) while other studies did (e.g., Krampe et al., 2011). Therefore, the question of how age affects (children's) dual tasking is far from being clarified.

What did we do?

In our project at the University of Basel, we examined a large, cross-sectional sample of children ($n = 138$; 8–13 years) and adults ($n = 37$; 19–46 years). Participants were examined using a cognitive-motor dual task. With respect to the motor task, they were asked to walk along an electronic pathway system (GAITRite Platinum, CIR Systems, Sparta, New Jersey, see Fig. 1), which allowed several gait parameters to be accurately measured. As is customary in gait analyses, we focused on gait velocity and assessed several gait-regularity measures that represent the rhythmicity of walking. This variability in human walking has been associated with a higher risk of falling (e.g., Lundin-Olsson et al., 1997) and this rhythmicity develops slowly across childhood and early adulthood (Hausdorff et al., 1999). With respect to the cognitive task, we focused on various executive-function components. In particular, we asked participants to walk while solving three concurrent, cognitive tasks with each one tapping their inhibition, updating, and switching skills. This decision was based on (i) previous literature implying that executive functions play a key role for human walking (e.g., Yogev et al., 2008) and (ii) research suggesting that executive functions consist of separable core components, namely inhibition, updating, and switching (cf. Diamond, 2013; Miyake et al., 2000; but see Doebel, 2000). Participants' single- and dual-task performance was examined and compared for the cognitive and motor domain. In addition, we took care to address methodological shortcomings identified in previous research (cf. Saxena et



Source: Priska Hagmann-von Arx / Faculty of Psychology at the University of Basel

Figure 1. Picture of a girl walking along the electronic pathway system while fixating a point.

al., 2019)—for instance, we adjusted each participant's single-task behavior to a comparable level prior to the dual tasks.

Using this methodological approach, our results indicated performance decrements in gait velocity and gait regularity from single to dual tasks, resembling findings from studies with older adults (e.g., Springer et al., 2006). Importantly, the largest performance decrements were found when children and adults performed the updating and switching task as opposed to inhibition (Möhring, Klupp, Segerer et al., 2020). Likewise, participants' cognitive performance showed the largest performance reductions from single- to dual-task situations in the updating task. Our results revealed remarkable similarities in the general pattern of how cognitive tasks affected children's and adults' walking, implying that updating working memory representations and switching between rule sets seemed to be critically involved in human walking. With respect to age-related changes across childhood, our findings showed a differential pattern for our dependent variables. Whereas age was associated with gait regularity and cognitive performance, there were no relations between age and normalized velocity (Möhring, Klupp, Zumbrunnen et al., 2020). In particular, it was found that with increasing age, children walked more regularly in the dual-task situations and made fewer errors. Differential associations with age were found for the various executive-function tasks with respect to children's cognitive performance (but not for gait variables). Age was associated with performance in the updating and switching task, but unrelated to performance in the task involving inhibitory control (Fig. 2).

These results indicate that walking required indeed cognitive resources, and in particular resources related to updating and switching. Therefore, it seems that walking—a motor task often perceived as being rather automatized—is closely related to higher-order cognitive processes. We can only speculate why updating and switching may be more important processes for human walking as opposed to inhibitory processes. Being able to store and manipulate information in mind and to flexibly switch between different sources may be essential processes when planning one step after the other. Importantly, however, this result is highly useful when planning intervention studies, since focusing on these two abilities may improve walking. Our findings about age-related changes indicated that there is age-related improvement in children's ability to coordinate two tasks, as shown by children's increasing regularity in walking and higher accuracy in cognitive performance with age. Therefore, even after addressing methodological limitations of previous research, our findings demonstrated that older children could more easily cope with dual tasks than younger children, suggesting a considerable developmental progression of cognitive-motor dual tasking across childhood.

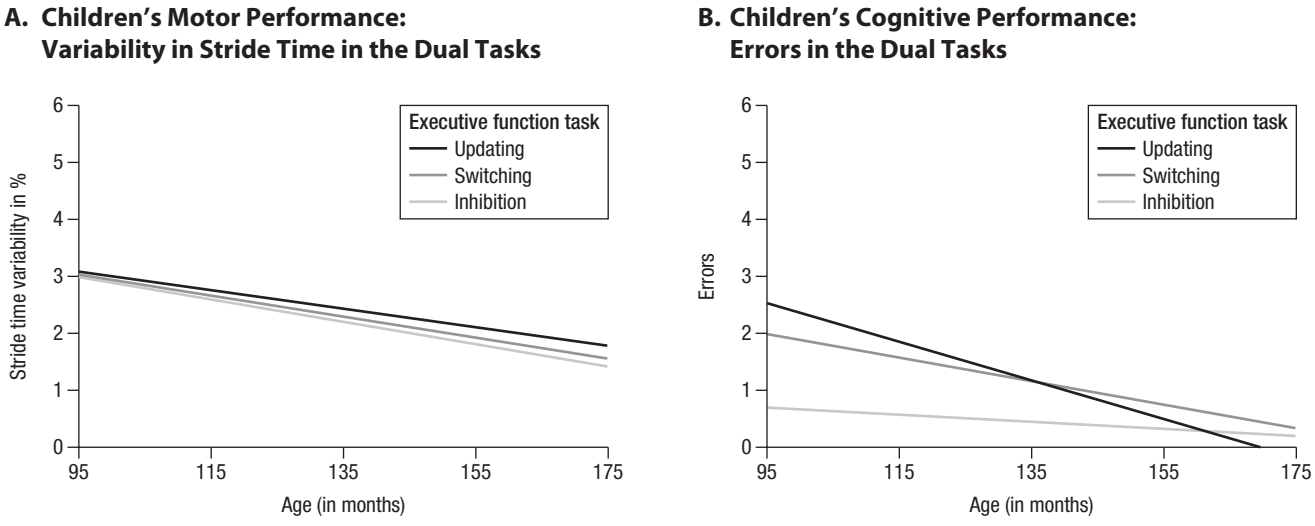


Figure 2. Relations between children's age in months with (A) their stride time variability and (B) their errors in the dual task as a function of the inhibition, switching, and updating task.

Adapted from Möhring, Klupp, Zumbrunnen et al. (2020).

What's next?

Our research project provided a unique possibility to address several open questions of previous studies using a large cross-sectional sample of children and adults while at the same time addressing methodological concerns of previous research. While we have started to look at important questions, there is still a lot to be done. One question that we are currently working on refers to examining children's prioritization strategies. On a group level, the data suggested that 8- to 13-year-old children prioritized the cognitive task, as indicated by higher costs in the motor domain. This result may indicate that children's postural stability in walking has not been challenged in the present methodology to an extent that their stability was at risk. As a consequence, this allowed children to sacrifice their walking behavior in the dual task for the benefit of their cognitive performance. As the present research design offers the chance to examine whether this general pattern differs for various executive-function components, we are currently tackling this issue. We also want to explore whether these trade-off patterns change with age. Furthermore, we are currently investigating whether interindividual differences in children's initial baseline level in the cognitive and motor domain may explain how adaptively children allocate their resources. And finally, we are assessing whether individual variables such as children's risk behavior (cf. Möhring et al., 2019, for other influencing variables) and context variables such as the relationship between children and parents may influence their children's prioritization strategy.

Future research at Saarland University aims to test young and older adults in cognitive-motor dual-task situations that differ in the challenge that they pose to the balance system (e.g., by using cup stacking versus walking on a narrow track as motor tasks). In the cognitive domain, a working-memory updating task (3-back) will be used. We assume that walking will elicit a stronger tendency to prioritize the motor task as compared to cup stacking, since walking includes a threat to posture. In addition, we want to investigate whether wearing an age simulation suit (Vieweg & Schaefer, 2020) makes young adults behave like old adults in demanding cognitive-motor dual-task situations.

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Reflecting Upon the Research Process in Psychological Science: Beyond Preregistration and Direct Replication

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In the past years, psychological (and other) research has been occupied with matters revolving around the replicability of empirical findings and questionable research practices that play a major role in the inability to replicate a vast number of what were thought to be established findings. From this period—that some have called a crisis, while others viewed it as the beginning of a renaissance or reform (e.g., Chambers, 2019; Nelson et al., 2018; Shrout & Rodgers, 2018)—the well-known open science movement emerged, with researchers of different disciplines around the world discussing ways to make the research process more transparent and less susceptible to different types of biases (e.g., Nelson et al., 2018; Nosek et al., 2015). The suggestions put forward to improve research practice mainly target methodological and statistical issues within the research process, such as preregistering hypotheses and analysis plans against p-hacking, HARKing, and the like, conducting power analyses to prevent underpowered studies, and engaging in large-scale replication projects to evaluate the robustness of existing findings (e.g., Nosek et al., 2015; Shrout & Rodgers, 2018; Wagenmakers et al., 2016). However, some scientists have argued that theoretical matters have been neglected so far and should receive more attention (e.g., Gray, 2017; Muthukrishna & Henrich, 2019; Oberauer & Lewandowsky, 2019).

In the following, I first give room to the perspective that focusing only on methodological and statistical issues within this whole movement of improving psychological science will probably not solve all of the problems. After presenting challenges that pertain to theorizing and some ideas to address them, I zoom out to take a broader look at the research process in psychology. As a last step, I zoom out a bit further to consider the role psychologists' view of science plays in the reform movement. The goal of this article is to raise awareness for challenges in (psychological) science revolving around theorizing and argumentation on the one hand, and for the role subjective beliefs and researchers' views of science might play in the entire research process. To this end, I draw on literature on the "replication crisis" (e.g., Muthukrishna & Henrich, 2019; Oberauer & Lewandowsky, 2019; Szollosi & Donkin, in press), philosophy of science (e.g., Flis, 2019; Wiggins & Chrisopherson, 2019), qualitative research (Field & Derksen, 2020; Malterud, 2001), as well as a critical reflection of experimental psychology (Gozli, 2019).

What happened to theories in psychological science?

"Science is built up with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house"

Poincaré, 1905, p. 141.

This citation by Henri Poincaré where he reflects upon what makes a good experiment has been used as a metaphor to emphasize that evaluating science only by its methods misses a major part: theory (Gray, 2017; Muthukrishna & Henrich, 2019). Expanding on this, Gray (2017) describes individual studies as bricks—bigger or smaller, even or uneven, depending on their contribution to the overall knowledge structure. He acknowledges that strong bricks are essential for a strong structure, that is, reliable methods are crucial for science. However, the bricks also need to be combined in a precise and sophisticated manner (i.e.,

Henri Poincaré
(1854–1912)

French mathematician, theoretical physicist, engineer, and philosopher of science. He is often described as a polymath, and in mathematics as "The Last Universalist," since he excelled in all fields of the discipline as it existed during his lifetime.

Photo: Eugene Pirou, 1887

individual studies only contribute meaningfully to scientific knowledge when theoretically embedded). Although theory and method complement each other in good science, it might easily happen that one loses sight of one or the other: As action identification theory (e.g., Vallacher & Wegner, 1987) suggests, the more one focuses on the "how" (within science: concrete methodological considerations, such as sample size), the less one might take the "why" (i.e., the "big picture;" within science: the underlying theory) into account and vice versa (Gray, 2017).

Different from this view of "losing sight of theory," others have argued that there are barely any strong theories within psychology (e.g., Szollosi & Donkin, in press), or that psychological science consists of a large number of unconnected "minitheories" (Muthukrishna & Henrich, 2019). Within this view, a major cause of replicability problems is bad theorizing. According to Szollosi and Donkin (in press), many theories within psychology are weak because of their flexibility. They build their criticism on Deutsch's (2016) criteria for good theories, according to which "good theories (1) explain what they are supposed to explain […], (2) are consistent with other good theories, and (3) cannot easily be adapted to explain anything" (Szollosi & Donkin, in press, p. 5). If a theory is weak ("easy-to vary"), it cannot be challenged by empirical tests because it can easily be changed to fit the respective finding (e.g., by introducing a moderator). This flexibility might be due to the "auxiliary theories or assumptions" many theories need (to bridge the gap to observation by, for instance, specifying contextual factors, or justifying a certain operationalization), leading to "theoretical degrees of freedom" (Carsel et al., 2018; Meehl, 1990). Therefore, (weak) theories need to be critically evaluated by argument before being tested empirically to avoid uninterpretable findings. Szollosi and Donkin further claim that although distinguishing between exploratory and confirmatory research is supposed to reduce flexibility, this attempt is misguided, because it might lead to a "temporary reduction in flexibility" (Szollosi & Donkin, in press, p. 8). More specifically, there is a multitude of predictions that can be chosen from flexible theories. In confirmatory research, some of these predictions are chosen a priori (i.e., the flexibility is temporarily reduced). If these predictions happen to fit the observation, people might consider the theory good *because of* this fortunate fit. If the predictions do not fit observation, the theory is not seriously threatened because alternative predictions "derived" from the theory can easily be adopted for the next experiment. What then distinguishes a flexible theory from a (good) theory that has been changed? Szollosi and Donkin (in press) recommend that a theory should not be judged based on whether it has been changed but rather based on how easily it can be changed. The value of preregistration is then that it makes changes in theory across experiments transparent. Oberauer and Lewandowsky (2019) point out that the distinction between exploratory and confirmatory research is usually unhelpful because it focuses only on the temporal order of specifying hypotheses and consulting the data. This distinction is used as a proxy to differentiate between arbitrarily chosen and justified hypotheses. However, it ignores the paradox of predictivism philosophers of science have formulated (e.g., Barnes, 2008, 2014), which contrasts two intuitions: (1) that a theory which predicts new data seems to be better than one that explains existing data; (2) that "the history of the researcher's state of mind" (Oberauer & Lewandowsky, 2019, p. 1606), that is, when exactly the researcher learned about an empirical finding, should not determine whether an empirical finding provides support for a theory.

Apart from the flexibility in psychological theories, the lack of overarching theoretical frameworks in psychology has been criticized (Muthukrishna & Henrich, 2019). Instead of well-conceived theories that connect multiple phenomena, textbooks often comprise a variety of disconnected empirical findings. However, overarching theories are crucial to narrow down the hypothesis space and to base predictions on more than just previous findings or intuitions. In presence of good overarching theories, far fewer experiments are needed, which makes science more efficient (Muthukrishna & Henrich, 2019). In a similar vein, van Rooij (2019) argues that psychological research often investigates effects instead of possible explanations for certain effects, again highlighting the lack of theory development.

How can theory be improved?

If one assumes that psychological research oftentimes lacks theory, the question arises how we can change this situation. Muthukrishna and Henrich (2019) suggest using already existing overarching theoretical frameworks, such as *Dual Inheritance*

Theory (e.g., Henrich & McElreath, 2007), from which specific predictions can be generated. Depending on the phenomenon of interest, it might be more or less intuitive to link the phenomenon to an existing overarching theory. Therefore, it might in some cases be helpful to use a stepwise procedure by considering different levels of explanation (e.g., proximal and ultimate explanations; Muthukrishna & Henrich, 2019).

Fiedler (2017) proposes what he calls "theory-driven cumulative science," an approach in which hypotheses are derived from existing (empirical) laws or logical constraints (e.g., regression to the mean, psychophysical functions). He notes that this theory-driven research constitutes one extreme on a continuum, whereas phenomenon-driven research is the other extreme. Similarly, Oberauer and Lewandowsky (2019) differentiate between theory-testing and discovery-oriented research, with theory-testing research having a strong logical link between theory and hypothesis, discovery-oriented research less so. Whereas practices such as direct replication and preregistration are crucial for discovery-oriented research, they are less helpful for theory-testing research. For theory-testing research, Oberauer and Lewandowsky (2019) recommend formalizing theories as sets of equations or propositions, or deriving hypotheses from simulations if formalization is not possible. Both types of research can make unique contributions to scientific progress and complement each other meaningfully. Related but not identical to these approaches is the notion of loosening and tightening processes in the creative cycle (Fiedler, 2018). Loosening describes variance-increasing processes that allow unconventional ideas, while tightening describes critically evaluating the generated items and keeping only the best ideas (variance-decreasing). According to Fiedler (2018), good theorizing as well as theory testing require both, loosening (e.g., generate new theories) and tightening (e.g., fit ideas to logical constraints).

Based on these positions, it seems that researchers need to become more sensitive to the different types of research and adapt the procedures to follow accordingly: When researching in a discovery-oriented/phenomenon-driven manner, one should carefully consider the methodological and statistical guidelines concerning direct replication and other techniques. Furthermore, one should avoid creating a flexible theory based on the researched phenomenon. This type of research might be seen as a form of empirical loosening (i.e., exploring a phenomenon). Once one has discovered an interesting phenomenon, one can engage in theoretical loosening by generating potential explanations. This should be followed by theoretical tightening during which one critically evaluates potential theories and develops a theory that is empirically falsifiable. This theory can then be tested empirically. When researching in a theory-testing/theory-driven manner, the theory under investigation needs to be strong, that is, it should be hard to vary and stand theoretical argumentation. The hypotheses derived from this theory should be closely linked to it so that testing these hypotheses empirically provides evidence for or against the theory. Independent of where on the continuum from theory-testing/theory-driven to discovery-oriented/phenomenon-driven one conducts research, it is essential to communicate transparently what one is doing, and why, and to consider carefully when to use the term "theory." In order not to neglect theory development in the research process, Gray (2017) advocates training in theory similar to training in methods. He encourages using theory mapping to facilitate theory development through visualization.

Zooming out: The research process as a whole

Now that I have outlined some challenges and potential directions for theorizing, I zoom out to take a broader look at the research process. When reflecting upon my own research, I came to a point where I asked myself: Isn't the research process as such an incredibly subjective endeavor, from developing theories or ideas to interpreting empirical findings? What I mean by "subjective" concerns the potential influence of one's attitudes and beliefs on the development of theories and hypotheses, the operationalization, and study design, as well as the results and their interpretation. To a certain degree, the influence of these attitudes and beliefs can be mitigated by open science practices, such as preregistration. However, I maintain that there are many instances for which we typically do not have established control mechanisms. For instance, when developing a theory and deriving hypotheses, not only established theories and knowledge impact our thoughts, but also individual experiences and beliefs we hold about the world and life. Similarly, how we operationalize a construct depends on the one side on our under-

standing of the construct and on the other side on our beliefs about participants' beliefs and perceptions. Because as psychologists we typically investigate other human beings, the stimuli we create potentially influence participants' understanding of the construct under investigation, which in turn might impact the responses they give, and hence the conclusions we draw from the data.

Another point related to the study setting concerns the interpretation of the study setting as such. According to Gozli (2019), we need to consider goal hierarchies when conducting experiments and interpreting their results. In experimental settings, participants are usually aware that they are taking part in a study (at least from a certain age on). By agreeing to participate, they adopt certain goals that are partly provided by the experimenter. For instance, they might adopt the superordinate goal of "being a good participant" which can be achieved by "adhering to the instructions." Through these instructions, experimenters usually provide subordinate goals such as "Respond as fast and accurately as possible to x."

What is often neglected when interpreting the findings of experiments is the fact that participants' personal goals might interfere with the goals provided by the study setting. Gozli presents a study by van Steenbergen and colleagues (2014) as an example: To investigate the idea that people might have lower cognitive control when they are passionately in love, these authors made the participants think about their romantic love through imagination, writing, and self-selected music to listen to. Then the researchers tested the participants' selective attention. Gozli (2019) argues that instead of interpreting the findings as supporting the authors' initial idea, one might conclude that "people perform poorly when asked to pursue goals about which they care little, especially after we remind them of something else about which they care very much" (Gozli, 2019, p. 59). This example nicely illustrates how researchers' interpretation of findings might be shaped by their perception of the experiment. In this specific case it might have helped to consider the concrete processes (i.e., create a stronger theory) through which passionate love might impact cognitive control, such as shifts in goal priorities.

On a more general level, I deem it crucial to try to step out of our research bubble every now and then to take a new perspective or at least to become aware of our attitudes and beliefs related to our research. In qualitative research, the term reflexivity describes the process of considering the effect of the researcher on the research process in every step (Malterud, 2001). Once explicitly taken into account, this subjectivity in the research process does not necessarily have to be a disadvantage (Field & Derksen, 2020); it could be, for instance, the basis for constructive discussions with other researchers. Because we are oftentimes caught in our little research bubbles, discussions with researchers who do not share our understanding of the construct of interest, or who are concerned with entirely different constructs are invaluable. Ideally, such exchanges take place on different levels of "research distance," for instance between labs studying the same constructs, labs belonging to the same field of study but investigating different constructs, labs belonging to the same overarching discipline but operating in different fields, or between different disciplines. The smaller the research distance, the larger the overlap in attitudes and beliefs probably is. The larger the distance, the more challenging it is to find common terminology and prevent misunderstandings. Therefore, it might be tempting to exchange more with "closer researchers" than more distant ones with the danger of confirming each other's (shared) beliefs. Once exchange takes place on an interdisciplinary level, different perspectives on science (e.g., What is science? What should it be?) come into play. Because these conceptions are potentially relevant in improving the research process, I briefly cover them in the next section.

Zooming further out: Psychologists' views of science

At the beginning of this article, I introduced the perspective that in this reform process of psychological science across the last years the focus has been on methodological and statistical improvements, and not so much on theorizing. But why? Fiedler (2018) argues that this emphasizing of procedural norms and tightening processes in the sense of strict monitoring of research practices reflects the current "compliance zeitgeist" that is not restricted to science. From a historical and philosophy-of-science perspective, Flis (2019) states that psychologists' view on humans, and therefore also scientists, influences their perception of science and how it should be. For instance, he explains that neobehaviorists like Edward Tolman viewed the world as a maze of which scientists create cog-

nitive maps to navigate, similar to the spatial maps rats build when exploring a maze. In a similar vein, Flis (2019) maintains that advocates of the reform movement in psychology view humans as irrational, in line with research on reasoning and rational thinking from the 1980s onwards. Consequently, scientists are perceived to be prone to different types of biases that impact their research negatively (e.g., confirmation bias, see e.g., Simmons et al., 2011; Wiggins & Chrisopherson, 2019). In addition to this susceptibility to bias, the scientific system psychological researchers operate in incentivizes certain biases (e.g., by placing a high importance on publishing while preferably significant results are published, see e.g., Nosek et al., 2012). Within this perspective, improving psychological science means compensating for human biases and increasing objectivity by changing the system so that it exerts more control over biases instead of incentivizing them. Science as such constitutes a process of data production to reduce uncertainty by using scientific methods to test certain hypotheses (Flis, 2019). There does not seem to be much space for theorizing by irrational scientists. Thus, the reform movement mirrors psychologists' conception of science. Aside from the scientific method, which is treated as the heart of psychological science, Flis (2019) claims that there is a certain "opaqueness" in psychologists' view of science; it remains unclear what psychological science was before its reform, and what it will be in the future. Perhaps it would be an option to acknowledge scientists' subjectivity, but instead of trying to ban it from the research process, take it into account.

Conclusion

In this article, I tried to point out a different perspective on the research process in psychological science than the one taken by many reform advocates. This is not to say that I disagree with the reformers' points but rather that I perceive the movement as imbalanced, with a strong emphasis on improving methodology and statistics while neglecting theory. Therefore, I presented some perspectives on problems in current theorizing and possible improvements. Furthermore, I pointed out that subjectivity is present in all parts of the research process but that there seems to be no place for it in current views of psychological science (Wiggins & Chrisopherson, 2019). Possibly, the attempt to ban subjectivity from the research process led to reducing the research process to a data production process. The question that still needs to be answered is: What do we want psychological science to be tomorrow?

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360-degree panoramic image of the Milky Way. Source: https://www.eso.org/public/

Winner of the

LIFE Outstanding Alumni Award 2020

Jessica A. Bernard

UM alumna, now Assistant Professor Professor of Cognition and Cognitive Neuroscience at A&M Texas University.

She will receive the award and give a lecture on her work during the Spring Academy 2021 at UM, Ann Arbor.

Congratulations, Jessica!

Selected Publications

Bernard, J. A., Nguyen, A., Hausman, H. K., Goen, J. R. M., Maldonado, T., Ballard, H. K., Jackson, T. B., Eakin, S. M., & Lokshina, Y. (2020). Shaky scaffolding: Age differences in cerebellar activation revealed through activation likelihood estimation meta-analysis. *Human Brain Mapping*. Advance online publication. https://doi.org/10.1002/hbm.25191

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Bernard, J. A., Orr, J. M., & Mittal, V. A. (2016). Differential motor and prefrontal cerebello-cortical network development: Evidence from multimodal neuroimaging. *NeuroImage, 124A*, 591–601. https://doi.org/10.1016/j.neuroimage.2015.09.022

Virtual Fall Academy 2020: Fellows' Abstracts

In alphabetical order by author

Contact information available at https://www.imprs-life.mpg.de/people

Pathways from maternal depressive symptoms during childhood to offspring academic achievement in adolescence

Laura Bechtiger, UZH
Advisor: Lilly Shanahan

Maternal depressive symptoms are adverse experiences for children and have pervasive longitudinal effects on offspring socio-emotional adjustment. Yet, less is known about its association with adolescent academic achievement and possible pathways. We tested whether elevated maternal depressive symptoms in early childhood are associated with adolescent academic achievement through cumulative school-relevant parenting risk and school-related child functioning (i.e., adaptive skills, inhibitory control, and depressive symptoms) and whether these associations differ by sex. We used six waves spanning 13 years of a prospective-longitudinal community study (N = 389) with multi-informant data. Maternal depression was self-reported at child ages 2, 4, and 5. School-relevant parenting risk was parent- and teacher-reported and observed at age 7. School-related child functioning was child-reported, teacher-rated, and laboratory-test based at age 10. Academic success at age 15 was assessed with 10th grade grade-point average and on a standardized achievement test. Structural equation modeling was used to test indirect effects and multi-group modeling to examine sex differences. We found that elevated maternal depressive symptoms in childhood are indirectly associated with academic achievement in adolescence through increased parenting risk at age 7 which, in turn, was associated with lower levels of adaptive skills and inhibitory control, and higher levels of depressive symptoms at age 10. No sex differences were identified. Our study highlights that maternal depressive symptoms may be followed by a chain of risk by impairing several dimensions of school-relevant parenting and school-related child functioning, which, in turn, could impair children's future educational, career, and income opportunities.

SEM power simulations for differentiating competing models of memory structure in children

Elisa Buchberger, MPIB
Advisor: Markus Werkle-Bergner

An adaptive memory system requires different mnemonic functions that enable us to remember specific events of the past (episodic memory) while building up generalized knowledge about the world (schematic knowledge). Current theories on memory in adults postulate separable mnemonic processes as underlying neural computations supporting these functions, which entail (i) pattern separation that aids to discriminate between similar experiences, (ii) pattern completion that reinstates a whole event from partial cues, and (iii) generalization that exploits commonalities among related events to generate novel inferences. The planned study sets out to test whether the tripartite episodic memory structure is already present in childhood.
The main question will be addressed by probing competing models of memory structure in children through model comparisons using structural equation modelling (SEM). Commonly, sample size estimation for SEM model fit comparisons has often relied on generic rules of thumb. However, simulation studies have provided evidence that such an approach can be unreliable and that the required sample size heavily depends on the research question at hand. In this work, we leveraged Monte Carlo simulations to estimate required sample sizes to achieve adequate power for the suggested model comparisons of non-nested structural equation models. Such simulation methods can further help evaluate the importance of different model parameters on the sample size estimation, including correlation of latent factors and loadings of the manifest variables. Importantly, this approach enables the assessment of theoretical predictions on the structure of the building blocks undergirding children's memory capacities in a SEM framework.

We are family: Preliminary results of a study on the lifespan development of major life goals

Laura Buchinger, DIW
Advisor: Gert G. Wagner

Major life goals are important structural units in human development. On a societal level, they provide information about age-graded norms and expectations, on the person level they are related to well-being and enable individuals to actively shape their development. Yet, research on goal trajectories over the lifespan is sparse and often focusses on a specific developmental stage (mainly adolescence and early adulthood). Using data from the German Socioeconomic Panel Study (*N* = 52,052; age range: 18–84 years), we applied a cohort sequential longitudinal design to investigate appraisals of major life goals over the lifespan. Data from six waves covered a study period of 24 years (1992–2016). We find that a happy relationship or marriage, having children, and being there for others are the highest rated goals throughout almost the entire lifespan. Only at age 18, a successful career is rated as equally important. Whilst the trajectories of some goals (e.g., personal fulfillment, social or political involvement, and career success) reflect typical age-graded developmental tasks and needs, others (e.g., having children) remain important even after developmental deadlines have passed. Gender differences were strongest for having a happy relationship or marriage. Women's appraisal ratings followed an inverted U-shaped curve with a tipping point at around 40, whereas men's appraisals of a happy relationship or marriage continued to increase.

Longitudinal associations between prenatal testosterone and postpartum outcomes in lesbian couples

Kristi Chin, UM
Advisor: Robin Edelstein

Although increasing numbers of gay and lesbian individuals ultimately become parents, the vast majority of research on the transition to parenthood focuses exclusively on heterosexual samples. Even less is known about the physiological implications of this major life transition among those who identify as sexual minorities. The present study begins to redress these gaps in the literature by assessing prospective links between prenatal testosterone, a steroid hormone that is negatively associated with nurturance and caregiving, and postpartum outcomes in a sample of 25 first-time expectant lesbian couples (*N* = 50 individuals). Consistent with prior work in heterosexual samples, which suggests that lower testosterone promotes both partnering and parenting, we found that, in both partners, lower testosterone during the prenatal period predicted better romantic relationship and parenting outcomes at three-months postpartum (e.g., higher relationship quality, more time spent doing baby care). There was also evidence for dyadic associations; for instance, birth mothers reported more overprotective behavior, and non-birth mothers reported greater commitment, when their female partners had lower testosterone. Together, our findings contribute important new knowledge about the functionality of testosterone in close relationships contexts, including some of the first evidence among sexual minorities.

Quantifying transitions within multivariate binary timeseries data: A simulation study

Katharine E. Daniel, UVA
Advisor: Steven M. Boker

Quantifying transitions within multivariate binary timeseries data presents an analytical challenge across fields. We propose a novel method to characterize these timeseries data by constructing transition matrices to ultimately derive measures of stability and spread. We define a transition matrix, X_{ij}, for person i within individual window j as a k x k matrix such that k is the number of binary timeseries to be included in the analysis; N is the number of participants; max(j) varies by individual depending on a hyperparameter W; W is a positive integer greater than or equal to two representing the number of observations within a set of timeseries that contributes to a given matrix X_{ij}. Stability is defined as the proportion of observations along the trace X_{ij} relative to all observed elements within that matrix and spread is defined as is the proportion of all non-zero elements in X_{ij} relative to all possible elements in that matrix. To gain insight into this novel method, we simulated multivariate binary timeseries data that differed on the following dimensions: N = {20, 50, 75, 100}; k = {2, 10, 20, 30}; number of observations per person L = {10, 25, 50, 100}, W = {.02, .05, .1, .2 of L}, and underlying stability and spread strength indicators = {10, 25, 50, 75, 90}.

We conducted 1,000 runs for each possible combination of the above dimensions for a total of 1,728 different simulations taking approximately 3,000 hours. Initial investigations of these simulation results support the mathematical differentiation between stability and spread. Further, stability and spread values are related to the number of timeseries (k) included in the transition matrix, such that fewer included timeseries restricts variance in possible stability and spread values. Additionally, the value of hyperparameter W exerts a stronger influence on spread relative to stability values, such that as W gets larger, spread values generally increase whereas stability values remain relatively constant across varying W. This talk will present these and additional insights gained from this simulation study.

Intergenerational brain similarity and biobehavioral synchrony: Considerations for early brain development

Plamina Dimanova, UZH
Advisor: Nora Raschle

Background. For a long time, research has been restricted by employing single-subject approaches to examine human behavior. Incorporation of inter-subject investigations is emerging in behavioral research, but remains rare in biological research. Intergenerational designs and the consideration of interindividual transfer effects account more accurately for social human nature, for example through the exploration of cognitive and biological processes in dyads. This paradigm shift is especially informative in developmental research and allows a step towards disentangling some of the genetic and environmental effects (or the interaction thereof) on the human brain's formation.
Aims and Methods. Since it is well known that caregivers play a crucial role in children's development, our research targets interindividual influences on early socioemotional development using intergenerational neuroimaging designs and the study of interindividual biobehavioral synchrony. *Study 1* investigates intergenerational transfer effects within the corticolimbic system in mother-child dyads. We will compare structural brain measurements that predominantly develop in utero (surface area and gyrification) to measurements more strongly shaped postnatally (cortical thickness and gray matter volume). Prior knowledge suggests strong matrilineal transfer effects, thus mother–daughter similarity is expected to be higher than mother–son similarity. *Study 2* is based on a collaborative meta-analysis investigating biobehavioral synchrony, and its effect on cognitive outcomes and learning for children and adolescence. Based on the existing evidence, a unified framework will be created and its relevance to cognitive development in childhood will be discussed.
Significance. Both projects employing inter-subject approaches highlight the importance of interindividual influences on children's neurobiology and cognitive functioning.

Investigating the mediating role of stress and resilience following early abuse and neglect on cognitive and physical functioning in older age

Carla Eising, UZH
Advisors: Andreas Maercker & Myriam Thoma

Background. Abuse and neglect (AN) in childhood or adolescence, especially when experienced within welfare settings, have been linked to negative health implications throughout the life course. However, previous research has focused on examining young to middle adulthood and predominantly studied mental or physical health conditions. The current study sets out to examine cognitive and physical functioning in older adults with a history of early AN, and welfare-related AN in particular. Furthermore, stress and resilience are introduced as potential mediators.
Methods. In the risk group (history of welfare care) a total of n = 119 affected individuals (M_{age} = 70.42, 41.2% female) were examined and compared to n = 123 age-matched controls (M_{age} = 70.72, 50.4% female). Exposure to AN in childhood and adolescence, cognitive and physical functioning, stressful life events, and resilience were assessed using self-report and behavioral inventories.
Results. Particularly in the risk group, higher exposure to AN was associated with lower cognitive and physical functioning. For individuals of the risk group, stressful life events were found to be a mediator for AN and physical functioning. In the control group, resilience mediated the relationship between AN and cognitive functioning.
Discussion. The exposure to AN, and particularly AN within the context of welfare care, exert negative effects on cognitive and physical functioning up till old age. Clinicians and policy makers are

encouraged to address the promotion of protective resources (i.e., resilience) and prevention of harmful factors (i.e., stressful life events) as to ameliorate cognitive and physical functioning in survivors of AN into older age.

Telling true from false news: A metacognitive lifespan perspective
Michael Geers, MPIB
Advisor: Ralph Hertwig

Americans over 65 shared nearly seven times as many articles from fake news domains as the youngest age group during the 2016 U.S. presidential campaign (Guess, Nagler, & Tucker, 2019). Yet despite this empirical finding, recent experimental research indicates that the ability to distinguish true from false news headlines in fact improves with age (e.g., Pennycook & Rand, 2019). Moreover, high school students have been found to lack basic skills of digital media literacy (Breakstone et al., 2019). While the role of age in false news discernment is far from settled, gaps between actual and perceived knowledge have not been systematically investigated, let alone from a lifespan perspective.
In a first exploratory study, we presented U.S. participants (N = 201) with 24 news headlines. Half of these news headlines were accurate and the other half were inaccurate. For each news headline, respondents evaluated the accuracy of the headline (binary choice: accurate vs. inaccurate) and how confident they were that their decision was correct (subjective probability judgment: six-point scale ranging from 50 to 100%).
The present project allows to investigate people's metacognitive ability—how well they know what they (don't) know—for false news discernment from a lifespan perspective. To this end, we plan to explore people's discrimination ability (i.e., the extent to which confidence discriminates between correct and wrong decisions) and calibration ability (i.e., the extent to which subjective and objective probabilities match) across age groups. Implications will range from individual decision-making to the social dissemination of misinformation.

A dynamic structural equation approach to modeling cumulative advantage across the lifespan
Andrea Hasl, University of Potsdam
Advisor: Martin Brunner

Across scientific disciplines, the notion of cumulative advantage is recognized as a mechanism that magnifies small initial differences between persons and drives growing inequality between individuals over time. Examples of developmental processes that can be prone to such cumulative advantage would be developmental trajectories from childhood to old age, skill acquisition, or long-term life outcomes such as educational paths and wage development. In the present talk, we show how cumulative advantage and the lifespan perspective can be integrated into a coherent statistical framework and analyzed utilizing multilevel dynamic structural equation modeling. This opens up a new way to link individual microlevel processes to macrolevel patterns of heterogeneity and to empirically investigate the mechanisms that drive growing inequality over time. We demonstrate the new approach by making use of longitudinal representative US wage data (NLSY-79) across a period of 38 years. Notably, the dynamic structural equation modeling framework is not only interesting for research on wages and wage dynamics, but for all disciplines interested in accumulation processes and growing between-person differences over time.

Training-induced brain changes during motor skill learning in humans and mice
Maike Hille, MPIB
Advisors: Simone Kühn & Ulman Lindenberger

In humans, non-invasive methods are used to assess brain morphometry at the macroscopic level in order to investigate structural plasticity. However, these measures do not provide precise information about the underlying biology of the changes. Therefore, invasive recordings are used in animal models to capture changes in neural structure at the microscopic level. Still, there is little progress in bringing the different measures in animals and humans together (Barron et al., 2020). In my talk, I will present our plans to bridge the explanatory gap between animal models and human research and make a direct link between structural MRI measures and the underlying biological mechanisms of motor cortex plasticity.

Human research suggests that changes in gray matter volume in response to motor training are non-monotonic, meaning that a phase of expansion is followed by a phase of renormalization (Wenger, Brozzoli et al., 2017). Similar patterns of expansion followed by partial renormalization have been found in animal models. This suggest that motor skill acquisition is accompanied by curvilinear neural changes such as dendritic spine growth followed by spine elimination (Xu et al., 2009). Together, these findings converge to the exploration-refinement-selection model of brain plasticity in humans proposed by Lindenberger and Lövdén (2019). In my project, I aim to delineate the biological mechanisms that regulate experience-dependent plasticity during motor skill acquisition in humans while addressing the explanatory gap between animal and human research.

Electrophysiological indicators of sleep-associated memory consolidation in 5- to 6-year-old children

Ann-Kathrin Joechner, MPIB
Advisor: Markus Werkle-Bergner

In young adults, the precise temporal coordination of fast spindles (typically ~12.5–16 Hz) and slow oscillations (< 1 Hz) is considered a key mediator of memory consolidation during sleep. However, across development, spindle and slow oscillation morphology changes profoundly. Thus, it remains elusive whether the same mechanisms of sleep-associated memory consolidation as identified in young adults are comparably functional across childhood. Here, we characterise slow (typically ~9–12.5 Hz) and fast spindles and their temporal coupling to slow oscillations in 24 preschool children. Further, we investigate whether slow and fast spindles and their modulation during slow oscillations are similarly associated with behavioral indicators of declarative memory consolidation as suggested from adult literature. Leveraging an individualized, development-sensitive approach, we reliably identify an endogenous, development-specific fast spindle type, though nested in the adult-like slow spindle frequency range, along with a dominant slow spindle type. Further, our results indicate the presence of a modulation of fast spindles during slow oscillations, already in preschool children. However, the temporal coordination between fast spindles and slow oscillations is weaker and less precise than expected from adult research. While we do not find evidence for a critical contribution of the pattern of fast spindle modulation during slow oscillations for memory consolidation, crucially, both slow and fast spindles are each differentially related to sleep-associated consolidation of items of varying encoding quality. To conclude, our results reveal two functionally relevant, inherent spindle types in preschool children despite not fully matured spindle–slow oscillation coupling.

Pubertal timing and daily adult alcohol consumption: Examining mediating effects of alcohol beliefs by gender

Dominic Kelly, UM
Advisor: Adriene M. Beltz

Early pubertal timing is thought to have implications for adolescent substance use. It is unclear whether these effects persist into adulthood due to limitations of past work (e.g., no ecologically valid alcohol measurement), and if they do, what mechanisms may play a role. Participants were 117 women and 66 men aged 18 to 45 years, who completed an intake session followed by a 75–100-day smartphone study with an average response rate of 88.46%. At intake, participants completed a validated retrospective measure of pubertal timing and a measure of beliefs about the effects of alcohol, which was coded into three subscales reflecting possible mechanisms underlying alcohol use ($\kappa = .801$): Positive, Social and Relaxation. Each day of the smartphone study, participants reported their alcohol consumption in an ecological relevant way by reporting the exact number of units consumed. Three mediation analyses were conducted for each gender separately with pubertal timing as the predictor, daily alcohol consumption as the outcome, and alcohol beliefs as mediators. There was evidence for downstream effects for women: later pubertal timing predicted greater daily alcohol consumption. Although alcohol beliefs predicted consumption in both genders, only Relaxation beliefs mediated the link between timing and consumption for women, such that early maturers believed that alcohol's effects would be stress-reducing. There were no significant pubertal timing effects in men. Findings are broadly consistent with the maturational disparity hypothesis and highlight that, as in adolescence, pubertal timing has implications for alcohol consumption in adulthood,

but that gender and alcohol beliefs play novel roles.

How do different components of task switching improve with prolonged training in children?

Neda Khosravani, MPIB
Advisors: Ulman Lindenberger & Yana Fandakova

Task switching, or the ability to flexibly switch between tasks, allows us to effectively adapt our thoughts and actions to rapidly changing environmental demands. Switching between tasks is frequently slower and more error-prone than repeating the same task.

We examined practice-related improvements of task switching in 8- to 10-year-olds across 9 weeks (27 practice sessions). In addition, to follow the trajectory of change, children practiced the same tasks every other week, and novel tasks in the weeks in-between. Participants worked on three rule sets either separately in single-task blocks or simultaneously in mixed-task blocks, where they switched between rules. An intensive task-switching group (N = 66) who mostly practiced mixed-task blocks was compared to an intensive single-task group (N = 70) who mostly practiced single-task blocks, and to a no-contact control group (N = 68). Additionally, participants completed working memory, perceptual speed, and untrained task-switching tasks at pre- and post-test.

Planned analyses will examine: (i) How do different components of task switching improve with practice? We will assess performance differences between mixed-task and single-task blocks to examine practice-related improvements in the maintenance and selection of rule sets. Performance differences when switching between rules compared to repeating the same rule within mixed-task blocks will be measured to examine practice-related improvements in the reconfiguration of rule sets. (ii) Do individual differences in the trajectory of practice-related change across 9 weeks predict training improvements and transfer to untrained tasks? (iii) Is training particularly beneficial for children with lower or with higher pre-test performance in task switching, working memory, and perceptual speed?

Applying new developments in propensity score matching to life event research: Personality and well-being trajectories over the transition to (grand-)parenthood

Michael Krämer, DIW
Advisor: David Richter

The study of life events can benefit from employing matching designs because of their ability to control for selection bias, distinguish age-related trends from event-related changes, and control for instrumentation effects, i.e., bias due to repeated assessments with the same questionnaire. Recent developments in the literature offer insights to further improve nonexperimental designs. Here, I focus on three design choices crucial to the successful application of matching in life event research. First, matching needs to achieve temporal alignment by assigning the control subjects who do not experience the event a common time scale with the cases. Examining the impact of first childbirth on specific domains of life satisfaction, we matched parents-to-be in the second survey year before first childbirth was reported and centered longitudinal observations of cases and controls around that time point. Second, justifying the selection of matching covariates has been neglected in previous empirical studies. In a new project on developmental trajectories of the Big Five and life satisfaction over the transition to grandparenthood, we aim to select covariates based on two lines of thought: Based on recommendations from the methodological literature, we include all available pre-treatment variables that are associated with both selection into treatment and the outcome. However, based on recommendations from the structural causal modeling literature, we then exclude all variables that act as colliders on the causal pathway between treatment and outcome or that block this causal pathway. Third, a new matching algorithm from biostatistics called rolling entry matching is briefly presented.

Regularized continuous time dynamic networks

Jannik Orzek, HU
Advisor: Manuel Völkle

In the network perspective it is assumed that associations between observations emerge from direct causal relations between the observed variables themselves. The arising models often map

the dynamics of numerous variables, promising to paint a more holistic picture of psychological processes. However, current longitudinal network models are limited by the strong assumption of equally spaced measurement occasions. This assumption is often violated in practice (for instance, in experience sampling studies). Therefore, we propose regularized continuous time dynamic models as an alternate to current longitudinal network models. Here, time is reintroduced in the parameter estimation procedure which allows for unequally spaced measurement occasions. Regularization is used to reduce the risk of overfitting in small samples and allow for a sparse drift matrix to improve model interpretation. The method is implemented in the R (R Core Team, 2018) package regCtsem and its use is demonstrated in a simulation study which shows that the proposed regularization improves the parameter estimates and correctly identifies true-zero parameters while retaining true-nonzero parameters in the model.

The MICRO study: Plasticity in the auditory domain

Eleftheria Papadaki, MPIB
Advisor: Ulman Lindenberger

Brain plasticity is an adaptive process that is triggered by a prolonged mismatch between the functional supply the brain structure can momentarily provide and the experienced demands the environment poses. Training studies with humans using magnetic resonance imaging (MRI) have provided evidence for structural changes in the human brain in intervention-related brain regions and changes in functional organization and activation strength. These studies vary in the domain they target, the intensity and duration of intervention, as well as the spacing of MRI acquisition points. Therefore, many aspects of plasticity manifestations remain partially understood and many questions remain open. With the MICRO study we aim to address some of these open questions. The planned study will be a longitudinal training study with young adults undergoing intensive behavioral training and frequent MRI acquisitions. The experimental group will perform auditory discrimination training while the active control group will undergo visual discrimination training. An extended neuroimaging protocol will be used for acquisition of structural and functional data at multiple time points. In this study we aim to investigate the relationship of structural and functional changes in the context of auditory training. In addition, we intend to investigate whether an emerging framework for interpreting plastic changes, the expansion-renormalization model, can account for training induced structural changes in the auditory domain. Furthermore, by utilizing standard structural MRI sequences together with more advanced quantitative MRI sequences we aim to characterize changes in structure with more detail and precision.

Age differences in neural selectivity at encoding and recognition

Claire Pauley, MPIB
Advisor: Myriam Sanders

One important factor contributing to age-related memory decline is the loss of distinctiveness with which information is represented in brain activity. This loss in neural selectivity may be driven by neural attenuation (i.e. reduced activation to target stimuli) or neural broadening (i.e. increased activation to non-target stimuli). Few studies have studied the specific patterns underlying neural selectivity, and those focused entirely on encoding, leaving it unknown whether attenuation or broadening drives neural selectivity at recognition.

In a fMRI study, a group of younger and older adults performed an incidental encoding task with face and house images and subsequently completed a surprise old/new recognition memory task. We assessed age differences in neural selectivity at encoding and recognition, the relation of neural selectivity to memory performance, and the underlying pattern (broadening vs. attenuation).

We found lower neural selectivity in older compared to younger adults at both encoding and recognition. Neural selectivity at both time points was positively related to memory performance, demonstrating the importance of distinct representations for memory performance. Crucially, while reduced selectivity in older adults was due to neural broadening at encoding, it was driven by neural attenuation at recognition. Furthermore, neural selectivity at encoding and recognition was highly correlated, indicating that one common mechanism may explain interindividual differences in memory performance.

Thus, we demonstrated that age differences in neural selectivity are present, but manifest differently at encoding and recognition, revealing how the utility of the task (i.e. passive viewing versus active recognition) interacts with age-related decline in neural distinctiveness.

Do fluctuations in psychological state affect exercise outcomes in older adults? Analysis plans for daily data
Sarah E. Polk, MPIB
Advisor: Uman Lindenberger

We wanted to investigate whether daily motivational state during a six-month exercise intervention would be related to attenuation of age-related decline generally seen in the brain and cognitive performance. To examine the role of motivation, as well as other psychological factors, in exercise-related outcomes (e.g., brain structure integrity and cognitive function) in 40 older adults (63–75 years old), participants were asked to respond to several questions probing their psychological state (e.g., "How motivated are you feeling today?") on approximately six days per week.
A visual inspection of daily motivation data suggests that there could be two main longitudinal patterns of motivational state; namely, there may be a sub-group of participants who remain motivated during the entire six months, while another sub-group may comprise individuals whose motivational levels drop over the course of the intervention with greater daily fluctuations.
We plan to analyze these data using growth mixture modeling (GMM), a method used to identify multiple unobserved sub-groups among a sample based on growth patterns, intercepts, inter-individual differences between sub-groups, and variances and covariances of the intercept and slope factors. We hypothesize that participants with higher overall and less variable motivation will show more beneficial outcomes on measures of brain structure and cognitive function (e.g., maintenance or gain), while participants with overall low motivation or who show a decrease in motivation over the course of the intervention may show an attenuation of exercise-related benefits in brain and cognitive outcomes.

Error management and uncertainty in generalization: The domain of food
Connair Russell, MPIB
Advisor: Annie Wertz

It has been argued that cognitive systems have been shaped by evolution to reduce costly errors, even if that increases the overall number of errors. It has further been argued that this may explain the existence of biases in learning for certain evolutionary relevant content such as plants (Wertz & Wynn, 2014), and danger (Barrett, Peterson, & Frankenhuis, 2016). Recently we have shown that there is also bias in generalization for dangerous content. However, this only appeared to be when the possibility of danger was the most uncertain. We therefore wish to examine the effect of certainty in generalization biases for information about danger. Moreover, a link between sensitivity in such error management and anxiety has been proposed. As such we will also test individual differences in anxiety and personality traits to examine if these are predictive of biased generalisation. Adult participants will be given a memory and generalization task. They will be presented with a series of food images of 3 color categories and told the images are either "toxic/not-toxic," or "grows in summer/doesn't grow in summer," depending on condition. For each color category the rate the property is present will be different, e.g., 75% of red items may be toxic, 50% of yellow, and 25% of green. Participants will then be presented with the images again and asked if they have the feature, to test recall, and with new food images from each colour category, to test generalization.

Addressing stressors associated with the transition to parenthood: Examining a teletherapy intervention for new parents
Shannon Savell, UVA

Becoming a parent is a joyous milestone for most couples, yet studies have consistently found that relationship satisfaction significantly declines after the birth of their first child (Shapiro, Gottman, & Carrere, 2000). Although previous research highlights the association between declines in romantic relationship satisfaction and negative psychosocial outcomes for children (e.g., Cowan, Cowan, Schulz, & Heming, 1994; Strohschein, 2005), very few preventative interventions have been developed to strengthen caregiver roman-

tic relationships during this critical time. Further, in the very few studies that have tracked relationship satisfaction and quality over time beginning in gestation of the couple's first child (e.g., Schulz et al., 2006), to our knowledge, no studies have used behavioral outcomes (e.g., coded from video-taped interactions) and biological markers of change (e.g., oxytocin receptor gene methylation) to investigate mechanisms of modification as a result of intervention.

The current study will rigorously evaluate the effectiveness of an evidence-based couples teletherapy intervention tailored for the stressors associated with the sensitive period of the transition to parenthood for first-time parents using a variety of psychosocial, behavioral, and biological outcome indicators. We expect that there will be a significant effect of the intervention on parenting stress and parent–parent relationship conflict and indirect effects on parenting practices and parent–child bonding. Creating an environment of success for navigating a stressful time may empower couples to develop a healthier relationship dynamic for co-parenting to foster a secure and supportive environment, which are key ingredients for children's positive psychosocial development (Cowan et al., 1994).

Working from home in times of coronavirus: Segmentation vs. integration of work and private life

Victoria Schüttengruber, UZH
Advisor: Alexandra M. Freund

Due to the coronavirus pandemic, many people have been and still are facing the challenge of having to work from home, and to re-negotiate the boundaries between work and private life. To achieve a successful work–life balance when working from home, one crucial question pertains to the degree to which people profit from the segmentation or integration of work and private life. While the media seems to unanimously embrace a message of the importance of segmentation, the empirical evidence of the advantages of drawing clear boundaries between work and private life is less clear. This study investigated experimentally if clear-cut and blurred boundaries differ regarding a set of subjective outcomes such as of productivity, inter-domain conflict, or exhaustion during the lockdown in Switzerland in May 2020. Boundaries between work and private life were manipulated by asking participants ($N = 79$) to implement recommendations that foster either clear-cut or blurred boundaries. Participants reported on their home office days in daily end-of-day assessments. Results of Bayesian analyses provide evidence that segmentation and integration do not differ regarding most outcomes. Segmentation preference did not moderate the effects. However, there was some evidence that in the presence of childcare-related demands, participants profited more from segmentation. The findings join the literature on work–life balance, boundary management, remote work, and psychological consequences of the coronavirus pandemic.

Noisy computations and suboptimal decision-making in aging

Alexander Skowron, MPIB
Advisor: Douglas Garrett

A variety of age-related changes on decision-making tasks have been reported across perceptual and value-based domains. These have often been ascribed to changes in cognitive model parameters leading to systematic deviations from optimal behavior or to the employment of decision heuristics. However, random noise in key variables of the decision process may also contribute to suboptimal behavior in older adults. In fact, changes in neural variability have been hypothesized to be a key factor in aging, which may yield adaptive or maladaptive consequences for behavior. Yet how noise affects the computations underlying decision-making in older adults is less well understood. To investigate this question, we have to disentangle different potential noise sources. Sensory noise affects the initial state of a decision variable and is often considered in perceptual decision-making models. Decision noise describes the degree of random responding with respect to the decision variables and is often assumed to mitigate the explore-exploit dilemma in reinforcement learning. Finally, computational noise reflects the stochastic implementation of the decision process leading to imprecise representations of decision variables. I will present ideas for a task to disentangle these different noise sources and their contribution to age-related changes in decision-making. I will also present some preliminary results investigating the role of computational noise in reinforcement learning behavior of older adults.

Single- and multilevel perspectives on covariate selection when planning randomized intervention studies on student achievement

Sophie Stallasch, University of Potsdam
Advisor: Martin Brunner

A promising strategy to optimize design sensitivity in randomized trials seeking to foster student achievement is to statistically control for vital covariates. But which covariates are most effective? From a psychometric perspective, maximum validity in the prediction of a specific achievement outcome (e.g., mathematics) may be attained via covariates that (I) are narrower rather than broader (e.g., mathematics pretest vs. intelligence or sociodemographics; bandwidth-fidelity/specificity-matching principle) and (II) have a shorter rather than longer time lag to the outcome (e.g., mathematics pretest 2 vs. 4 years ago; validity degradation principle). Most existing research fueling the respective debates has drawn on single-level (i.e., not hierarchically clustered) data. However, empirical guidance on covariate selection for educational researchers conducting cluster-randomized trials (involving random assignment of, e.g., schools to experimental conditions rather than individual students) is scarce. Using representative data of students attending grades 1–12 from the German National Educational Panel Study (N = 1,868,6731), we used single-level and multilevel latent covariate models to systematically study the impact of different covariate sets with varying (I) degrees of specificity and (II) time lags on design sensitivity in individually- and cluster-randomized trials for mathematics and reading as outcomes. Preliminary results suggest that both the bandwidth-fidelity/specificity-matching principle and the validity degradation principle largely apply well to single-level designs whereas outcome-covariate relationships appear more undifferentiated in multilevel designs. These findings indicate that both psychometric principles cannot unambiguously be generalized from single-level to multilevel contexts. Practical implications for the sample size planning of randomized trials are illustrated.

Affective and cognitive effects of exposure to urban vs. nature environment

Sonja Sudimac, MPIB
Advisor: Simone Kühn

Most of the world's population now live in cities, making the planning of healthy urban environments one of the most important policies. Although living in an urban environment comes with many advantages, it is associated with increased risk for schizophrenia, stress, and mood and anxiety disorders (Haddad et al., 2014; Lederbogen et al., 2011; Peen et al., 2009). It has been demonstrated that an only 90-minute long walk in nature has benefits for mental health and cognition (Bratman, 2015; Stevenson et al., 2018). However, neural mechanisms underlying the effects of exposure to urban and nature environments are not well understood.

To fill this gap, the first study within my dissertation examines how an one-hour walk in an urban vs. nature environment impacts psychological well-being, as well as underlying physiological and neural mechanisms. We expect exposure to nature to decrease participants' stress and have a positive effect on mood and working memory. Following this direction, we predict that neural activity in stress-related brain regions, the amygdala and the anterior cingulate cortex, is lower after exposure to nature compared to an urban environment. The second study investigates whether a 45-minute walk in an urban vs. nature environment has beneficial effects for mothers' and their infants' stress, measured with self-reports and cortisol levels from mothers' and infants' saliva and mothers' breast milk.

Understanding neural and physiological mechanisms behind nature's beneficial effects aims to influence the design of physical environments in ways that will optimize mental health in the rapidly developing urban world and consequently enhance citizens' well-being.

Housing interior architecture: The good, the bad, and the beautiful

Nour Tawil, MPIB
Advisor: Simone Kühn

Humans in developed urban contexts spend most of their time inside built environments, and it has been proven that these spaces have a deep impact on cerebral circuits underlying cognitive and motor activations, ultimately, shaping day-

to-day behavior (Gage, 2003). Within the COVID-19 pandemic context, spatial virtues of the house have assumed even greater importance now that people spend more time at home.

This project aims to clarify the effect of residential design on emotions, cognition, and behavior, taking into consideration individual differences, particularly age and personality types. Previous studies have investigated some spatial properties, like contour lines (Vartanian et al., 2013; Vecchiato et al., 2015), enclosure, and ceiling height (Coburn et al., 2020), light and textures (Naz et al., 2017), and colors (Franz, 2006; Naz et al., 2017). However, none have used multiple realistic, yet controlled environments, and explored them with neuroimaging techniques.

For that end, using virtual reality, participants in my first study will be immersed in twelve differently designed 360-degree, fully controlled environments, with spatial parameters manipulated separately and in combinations. The brain and body reactions will be explored through the measurement of neurophysiological, cognitive, and behavioral data, while the subjective judgement of the aesthetic experience will be assessed through qualitative and quantitative self-reporting measures.

In view of the lack of relevant studies, this project's goal is to identify architectural elements of environmental emotional qualities that may help reduce stress, improve cognition, and lead to an overall feeling of well-being in the home space.

Developmental trajectories of probability learning and choice behavior: A longitudinal investigation

Anna Thoma, MPIB
Advisor: Christin Schulze

Probability learning is a key ability for dealing with the demands of an uncertain world. What is the age trajectory of choice strategies relying on this ability and which cognitive factors shape the development of choice behavior? In a previous cross-sectional study, we found that while toddlers and adults tend to maximize probability in a repeated choice task, school-age children were more likely to probability match by use of a simple win-stay lose-shift heuristic. We suggested that toddlers' maximizing behavior was driven by a tendency to persist with one choice option, irrespective of whether this option maximizes probability. Probability matching and the use of simple heuristics, by contrast, are behaviors that need to be learned during childhood. In a planned longitudinal study, we will shed light on the intraindividual development of choice behavior. We will furthermore investigate the role of response inhibition in shaping maximizing behavior in toddlers and explore how different strategies evolve in relation to working memory capacity. Over two years, we will run three measurement waves and start out with an initial sample of 60 children aged 3.5–4.5 years. Data collection will take place exclusively online via Zoom to ensure safety of participants and researchers in times of a pandemic and to reduce the risk of participants dropping out. To our knowledge, this study is the first to track choice behavior of children longitudinally and will contribute to an ongoing debate about cognitive factors underlying probability matching and maximizing.

Emotional exhaustion in preschool teachers: The role of personal, structural, and social conditions at the workplace

Mareike Trauernicht, FU
Advisor: Yvonne Anders

Research has shown that preschool teachers are especially prone to develop work-related stress symptoms, such as burnout. However, the specific underlying factors at the workplace associated with emotional exhaustion—generally perceived as the core dimension of job burnout—in early childcare professionals remain widely unknown. Hence, this study aims at identifying personal and structural job conditions as well as social experiences at the workplace associated with emotional exhaustion. Further, we disentangle center-related versus teacher-specific predictors. We draw on data collected from a nationwide sample of preschool teachers participating in a large federal program. We used personal, structural, and social variables from 1394 preschool teachers in 204 centers. Multilevel analysis demonstrated that center differences explained only 5.8% of the overall variance in levels of emotional exhaustion. Further, our findings revealed that emotional exhaustion in preschool teachers was strongly associated with social working conditions, such as perceived team climate and relation to parents, but hardly with any structural or personal conditions. This has important practical implications for interventions, which should focus more on social experiences at the workplace,

such as team cohesion and communication with parents, than on structural regulations.

Affect contagion in daily life is mediated by perceptions of partner affect: A micro-longitudinal study with older couples
Elisa Weber, University of Zurich
Advisor: Gizem Hülür

Intimate relationship partners dynamically covary in their affective states. One mechanism through which intimate relationship partners experience and shape each other's affective states is affect contagion, i.e., the spread of affective states from one person to another. The degree to which social-cognitive processes are involved in affect contagion in daily life remains difficult to disentangle. The majority of older adults live together with a spouse/partner, and intimate relationships are one of the most important social contexts in the daily lives of older adults. Expanding on previous research, we focused on contagion of positive and negative affect between older relationship partners, and examined whether processes of affect contagion were mediated by perceptions of partner affect, i.e., how individuals thought their partners felt at previous moments. We used data from an experience sampling study with 152 older couples (304 participants; 65+ years old) who reported on their positive and negative affect, perceptions of their partner's positive and negative affect, and presence or absence of partners 6 times a day for 14 days (resulting in up to 84 measurement occasions per participant). Dyadic multilevel mediation models were used to evaluate our hypotheses. In line with expectations, we observed strong evidence that processes of positive and negative affect contagion between partners were mediated by perceptions of partner's affective states. Moreover, partner presence was unrelated to processes of affect contagion. Our findings help identify underlying mechanisms of affect contagion and support the notion that perceptions of close others' emotions might shape our own feelings.

Household chaos and infant intellectual development: A prospective study of youth from 3 to 24 months
Sean Womack, UVA

The present study extends previous research demonstrating associations between household chaos and cognitive development in middle-childhood to the first two years of life, a developmental period characterized by substantial cognitive growth and considerable time spent in the home environment. Participants were 1,236 infants clustered within 571 families recruited as a part of the Louisville Twin Study. Cognitive development was based on raw Bayley Test of Mental Development Index (MDI) scores, and household chaos was based on parent reports. MDI and chaos scores were collected at child ages 3, 6, 9, 12, 18, and 24 months. A random-intercept cross-lag panel model (RICLPM) was fit to examine within-subject and between-subjects associations between household chaos and MDI scores. Household chaos negatively predicted subsequent MDI scores, indicating that when families that deviated above their mean level of household chaos, the average infant within that family exhibited a lower MDI score at the subsequent assessment. MDI scores negatively predicted subsequent household chaos, indicating that parents reported levels of chaos below the family average following waves where the average infant within that family scored above their average on the MDI. Both within-subject and between-subject correlations between chaos and MDI scores were nonsignificant. Findings from the present study indicate that across infancy, children demonstrated poorer mental abilities following periods of elevated household chaos. Child mental development also predicted subsequent household chaos, indicating a potential reciprocal relationship between child intellectual development and the home environment.

Panorama of Mauna Kea Observatories by Frank Ravizza. *Left to right:* United Kingdom Infrared Telescope, Caltech Sub-Millimeter Observatory (closed 2015), James Clerk Maxwell Telescope, Smithsonian Sub-Millimeter Array, Subaru Telescope, W.M. Keck Observatory (I & II), NASA Infrared Telescope Facility, Gemini North Telescope
https://commons.wikimedia.org/w/index.php?curid=79427685

10 Questions

Brenda L. Volling, Lois Wladis Hoffman Collegiate Professor of Psychology, Department of Psychology, University of Michigan

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How did you get involved in the study of child development?

I was an undergraduate at the University of Illinois at Urbana-Champaign and I was looking to get involved in research and eventually to do an honors thesis. I had been working in a psych lab at the time running experiments on adult motor memory, and even though I liked the professor and the research group, I really was not excited about doing a thesis on motor memory. I had enjoyed my introductory course in developmental psychology and particularly learning about Harry Harlow's different experiments on infant rhesus monkeys and social development, so I started looking through the list of faculty in the developmental area and came upon Ross Parke. At the time, he was working on a study of premature infants and their parents comparing parent-infant interaction, with both mothers and fathers, across families with premature and full-term infants. I found the work fascinating and knew immediately I wanted to be a part of this research group. Rather than running undergraduates through laboratory experiments, this research took me out into the homes of families, where we actually observed parents with their infants and coded interactions on site using what was at the time state-of-the-art coding technology (e.g., a DataMyte which actually was the size of a small brief case). Now, of course, we could do the same type of coding on any smart device that fits in the palm of a hand. I did not realize at the time how few developmental researchers actually considered fathers as parents (something I still write about today; Cabrera, Volling, & Barr, 2018; Volling & Cabrera, 2019) and how influential this time in the lab would be in crafting my career path. It was Ross who sat me down one day and asked me what I planned to do with my life, and when I informed him I would love to continue doing research on parents and infants, he directed me to graduate programs in Human Development and Family Studies (HDFS). I applied to and got into Penn State's HDFS program, where I continued to study parent-infant relationships and infant socioemotional development, eventually expanding my research into infant-father attachment relationships and family systems theory. I credit this early research experience and the mentorship of Ross Parke as pivotal in setting me down the path to study children's development, fathers, and families, and eventually being a professor.

Could you name books or articles that have profoundly influenced your own thinking about child development within the family context?

There are so many books I could list here but let me mention the ones that profoundly affected my thinking on family influence and children's socialization as a graduate student. The 1st edition of Michael Lamb's (1976) book, *The Role of the Father in Child Development*, probably started it all for me. The authors in that volume were some of the only people doing research on fathers at the time. Since then, I believe there have been five updated editions, but it was the initial volume that introduced me to the limitations of research on children's socialization when that research focused solely on mothers. Of course, Bronfenbrenner's (1979) book on the *Ecology of Human Development* was also influential as it made perfect sense to me that individuals were embedded in multiple ecological and interconnected contexts, and as such, needed to be studied in those naturalistic settings (e.g., home environment). Nearly every study I have conducted has included home observations of parents and children, including my last longitudinal study on the transition after the birth of a second child. A final article that had a profound impact on my thinking was the Dunn (1983) review, *Sibling Relationships in Early Childhood* published in *Child Development*. This article had been assigned as a reading in my graduate seminar on Social Development, and it absolutely changed how I thought about children's social development. Her argument was that even though most children grew up with siblings (over 80%), there were few developmental

studies that actually considered siblings as influential agents of socialization. Having grown up with four younger brothers, it did not take much to convince me there was a gap in our understanding of childhood socialization. That review and the Dunn & Kendrick (1982) book, *Siblings: Love, Envy, and Understanding*, were the reasons I chose to focus on the development of sibling relationships in early childhood for my dissertation research (Volling & Belsky, 1992), and why I continue to study children's sibling relationships to this day (Volling et al., 2017).

What do you consider the two main current debates within the field?

I'm not sure I would say there are any major debates in the family field. Most people would agree that the family is an important socializing influence on children. There are certainly intense discussions about what constitutes "a family" and the need to broaden the focus and inclusion of more diverse families and family structures.

What research topics have been neglected or have not received enough attention so far?

It should be pretty clear by this point what the answer to this question might be. Fathers and siblings, for sure, to broaden the focus on alternate socialization agents for children's development beyond mother-child relationships, but I would also add other significant family members (e.g., grandparents, half-siblings) and the consideration of diverse family forms (e.g., same-sex parents, adoptive parents). There have been so many changes over the past several decades with respect to demographic shifts, changes in social attitudes, the economy, reproductive technologies, and social media that have altered the pathways to parenthood considerably and have diversified what factors may affect children's development. Much of my research focuses on the perinatal period and the experiences of parents after the birth of an infant, so I have had numerous discussions with colleagues in obstetrics and gynecology over the years about advances in technology (e.g., in utero surgery, IVF), health care coverage (e.g., access to prenatal care), and policy changes (e.g., legalization of marijuana) in the US that have had profound effects on their practices, the women under their care, and fetal and infant development. Unfortunately, research on parenting and infant development has not kept pace with these societal changes and advancements in technology in a manner that offers much in the way of answers to their questions.

Another area receiving little attention is the use of on-line parenting sites and parenting blogs for information on pregnancy, birth, and parenting. One of my students recently did a study on what mothers shared with other mothers when posting on the parenting website BabyCenter with respect to pregnancy and the birth of a second child. I was truly shocked when I learned that there are 11 different BabyCenter websites in many different languages and countries, and the company boasts that more than 50 million parents visit these websites monthly; *50 million*! When is the last time any academic has had 50 million reads of their journal articles ever, yet alone in one month? Obviously, pregnant women and parents may be getting a lot of their information from these sites and parenting blogs. Perhaps most of the information is actually based on developmental science by experts in children's development, as many of these sites claim, but we all know there is a lot of misinformation and personal conjecture out there. As developmental scientists, we need to do a better job of keeping pace with what is happening out in the "real world."

You are focusing on the role of siblings for the development of children. Can you tell us more about this topic?

I have been working with my colleague, LIFE faculty Rich Gonzalez, on a longitudinal study tracking parents and their children across the "transition to siblinghood" over a period of three years after the birth of a second child. The transition to siblinghood marks the period when the firstborn moves from only child to older sibling, which represents a significant developmental milestone for both firstborn children and their parents. Estimates are that around 80% of families world-wide have at least two children. Prior writings on the transition period were often heavily entrenched in a developmental crisis framework, which is directly linked to the traditional psychoanalytic theories of Freud and Adler, who emphasized this period as a crisis or traumatic event for firstborn children. Because the only child was being dethroned and no longer the sole recipient of their mother's love and attention, the transition was considered a time where rivalry and disruptive behaviors

were considered commonplace. With funding from the National Institute of Child Health and Human Development (NICHD), we were able to successfully launch the first, large scale, longitudinal investigation in the US (Family Transitions Study, FTS) to examine the transition period surrounding the birth of a second child, with a focus on firstborns, their mothers and fathers, and their baby siblings. Our recent SRCD (Society for Research in Child Development) monograph (Volling, Gonzalez, et al., 2017) strongly refuted the transition as a developmental crisis. Most children showed no evidence of increases in disruptive behavior. Even though some children did exhibit high levels of problematic behavior after the birth, many of them had already been doing so before the birth, suggesting it was not the birth of the sibling, but family processes on-going in the family (e.g., parenting stress, parental depression, coparenting conflict, ineffective discipline) that were responsible for why children were displaying difficulties both before and after the birth. Unfortunately, some researchers still embrace the crisis mindset when writing about the transition, even though empirical findings, not just our own, clearly do not support such interpretations. Our team relies on a developmental framework where we take a more balanced perspective that acknowledges the behavioral difficulties that can arise for some children during the transition, but then we reframe these challenging child behaviors within a developmental growth framework. Most young children are toddlers around 30 months of age when a baby sibling is born, and toddlerhood, in general, is a period in which children's sense of autonomy begins to emerge, resulting in both increasing noncompliance and defiance (the so-called "terrible twos"), as well as the growth of social and emotional competence. Toddlerhood presents new challenges for parents as a result, and adding the birth of another child that alters the family system may stress even the most confident parents. I am now looking into ways that we can translate these findings into materials that can help support and assist parents making the transition so we can debunk the myths around the crisis narrative, and counter some of the misinformation out there on the internet and which, unfortunately, continues to circulate within some academic circles.

How can your research be applied to everyday life?

As I just noted, I am in the process of developing parent education materials that are a direct result of the research we have been conducting on the transition to siblinghood. Parents appear to be eager for information on how best to prepare their first children for the birth of a second child. Just type in "preparing for birth of a sibling" in any search engine. I am trying to figure out how best to translate what we are learning from the FTS project into information that can be given to parents, and perhaps more importantly, through what media do we disseminate and distribute this information.

What are you currently working on?

When we asked FTS parents what they did to prepare their first children for the arrival of the baby sibling, they overwhelmingly told us they had read them children's books about the new baby. Given the focus on the transition as a developmental crisis and some of the misinformation on websites directed toward parents, we started to wonder about the content of these children's books that parents were reading to their children, as most, if not all of them, are not written by developmental scientists. We have done an initial search of children's books devoted to the birth of a new baby (over 200) and our plan is to do a content analysis to see how these books portray children's reactions to a new baby. So far, there is no single message being conveyed in these books. Some of the stories are developmentally appropriate for a young child and reflect building a relationship with the baby, but others are really quite negative, underscoring strong dislike of the baby. I just finished one where the little boy was pushing his baby sister around the neighborhood in her stroller trying to get rid of her by giving her away to the different neighbors. Eventually, my goal is to come up with a list of recommended books for parents that encourage the development of a positive sibling relationship while at the same time, helping children deal with their negative emotions.

What do you like most about being a Professor of Psychology?

I have always enjoyed mentoring and helping students and junior scholars, particularly graduate students and postdocs in my lab, but also ear-

ly career scientists launching their own careers. I have a feeling this desire is related directly to my early mentoring relationship with Ross Parke and knowing that I probably would not be sitting here writing this today if he had not taken the time to listen and then nurture whatever it was he saw back then. I find it extremely gratifying to support individuals through their own developmental transitions whether it is finishing their honors thesis, getting accepted into graduate school, finally figuring out that dissertation topic, preparing to defend and eventually defending the dissertation, finding a postdoc, a tenure-track position, getting tenure, and the list goes on. I spent many years as the Director for the Center for Human Growth and Development supporting early career scholars from various disciplines such as psychology, public health, pediatrics, psychiatry, etc. This was an incredibly valuable experience because I learned what it means to be truly multidisciplinary. I was struck by how different disciplines, as reflected in the different schools and colleges at the university, often valued different pathways to "success" when it came time for promotion and/or tenure. I now have a deeper appreciation for different career paths and more flexibility in my own thinking about productivity and mentoring the next generation.

What do you get out of LIFE?

I think the LIFE program offers unique opportunities mostly for my graduate students that they are not getting in my lab or even in the University of Michigan program in developmental psychology. I like the fact that students are being exposed to different perspectives and areas of research they might not otherwise, so that they can truly appreciate the interdisciplinary nature of developmental science.

What is the added value of LIFE's internationality?

Of course, there is a benefit and added value to the international aspect of LIFE that allows ideas to be exchanged, to meet others from different universities and countries, and to acquire an appreciation for the different international settings, and even, educational systems across the US and German-speaking European countries. I did my graduate work at and received my PhD from Penn State in the Human Development and Family Studies (HDFS) program, and historically, there had been very close ties between Penn State HDFS and the Max Planck Institute for Human Development in Berlin. Paul Baltes had been on faculty at Penn State before taking the directorship at MPIB, and John Nesselroade was also a professor at Penn State before heading to UVA. As a result, there continued to be a strong international exchange of postdocs and faculty over my years in graduate school between the two programs. I feel I pretty much "grew up" on lifespan developmental psychology and international collaboration, so it is truly gratifying to see that this type of international collaboration around issues of lifespan development is still being continued and offered to students in the LIFE program.

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New LIFE Faculty in Berlin

Oliver Huxhold is a Senior Scientist at the German Centre of Gerontology (DZA) in Berlin. Among other things he is responsible for the supervision of doctoral students and the coordination of research on health and social relationships at the DZA. He conducted his doctoral studies on intraindividual dynamics in the context of the LIFE program at the Max Planck Institute for Human Development. In 2007 he graduated from Freie Universität Berlin and began his career at the DZA as an associate researcher in the project "German Aging Survey." In 2010 he took on a permanent position in the institute. He is a lifespan psychologist by training but concentrates on development in old age. His current research focuses on social relationships and places an emphasis on the impact of contextual conditions on individual development.

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Key publications

Fiori, K. L., Windsor, T. D., & Huxhold, O. (2020). The increasing importance of friendship in late life: Understanding the role of sociohistorical context in social development. *Gerontology, 66*(3), 286–294. https://doi.org/10.1159/000505547

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Telescopes Keck I & Keck II used by Nobel Prize winner Andrea Ghez

Left: Keck observatory with stars (top) and at sunset (below), Maunakea summit, Hawaii.
Source: https://keckobservatory.org/media/maunakea-summit/

Right: Mounted on the 10-metre Keck telescope, the HIRES-spectrometer is one of the world's most prolific instruments in the hunt for exoplanets.
Source: https://supernova.eso.org/exhibition/images/0511_E/

LIFE-Related Publications

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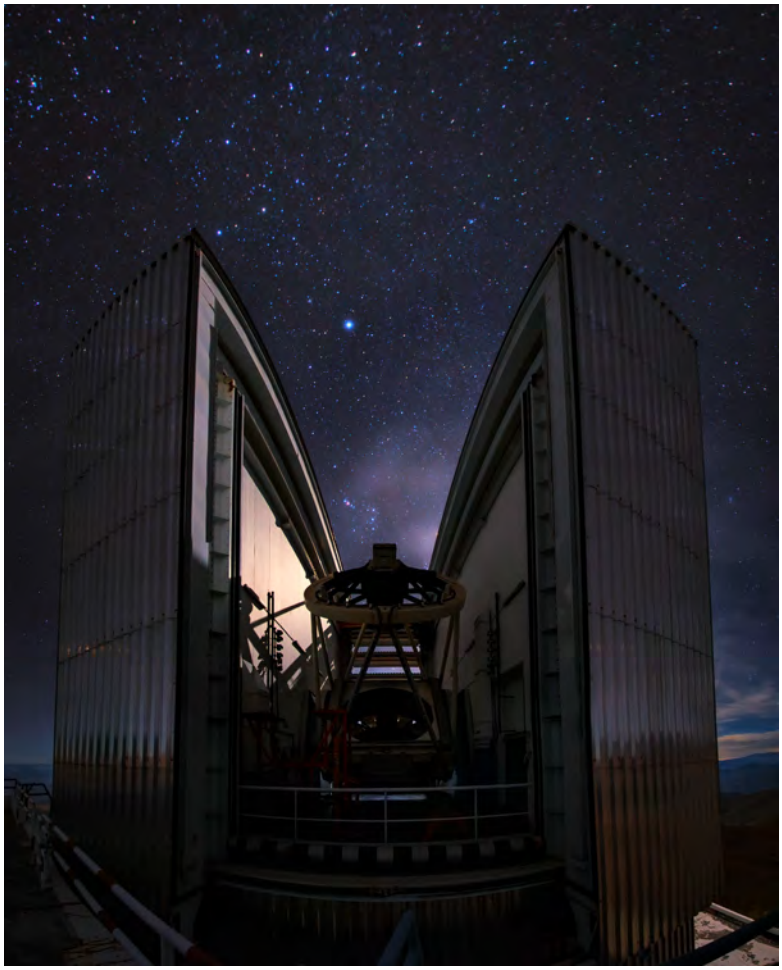
Telescopes used by Nobel Prize awardee Reinhard Genzel: New Technology Telescope (NTT) & Very Large Telescope (VLT)

Above: NTT at La Silla Observatory in Chile.

Right: Orion captured between the enclosure of the 3.58-metre NTT. Orion's Belt can be seen to point down to the mirror with the Orion Nebula glowing red to the left. Sirius is the bright star above.

Below: The site of La Silla Observatory on the outskirts of the southern part of the Atacama Desert.

Source: https://www.eso.org/public/



Left: VLT, at Paranal Observatory in the Atacama desert, is the world's most advanced optical instrument. The aerial photo shows the four enclosures for the 8.2-m unit telescopes and various installations for the VLT interferometer. Three 1.8-m VLTI auxiliary telescopes (ATs) and paths of the light beams have been superimposed on the photo. Also seen are some of the 30 "stations" where the ATs will be positioned for observations and from where the light beams from the telescopes can enter the interferometric tunnel below. The straight structures are supports for the rails on which the telescopes can move from one station to another. The interferometric laboratory (partly subterranean) is at the center of the platform.

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LIFE News

- The *Fall Academy 2020* took place online in Berlin (see pp. 22 ff. for fellows' abstracts).
- The virtual *Spring Academy 2021* is in planning in Ann Arbor and will take place around May 25 & 26.
- It will hopefully be possible to meet again in person at the following *Fall Academy 2021* in Zurich from October 9 to 13.

Exchanges

- All exchange activities are still on hold due to COVID-19. We hope they can be resumed in the course of 2021.

LIFE Berlin

- FU fellow *Rasmus Bruckner* successfully defended his dissertation entitled "Decomposing the Influences of Uncertainty on Learning: Normative Computations, Uncertainty Biases, and Lifespan Differences." He is remaining at FU as a postdoc working with Hauke Heekeren.
- HU alumnus *Jaap Denissen* has been appointed Professor of Developmental Psychology: Psychological Growth and Maladjustment at Utrecht University, The Netherlands. He will continue to work on personality development, with a focus on studying transactions between individuals and their (social) environments.
- HU alumna *Johanna Grosse Rüschkamp* has joined management consulting firm Oliver Wyman at their Berlin office.
- FU fellow *Lena Keller* successfully defended her dissertation entitled „The Interplay of Achievement and Achievement Motivation: Gender Differences in Math Top-Performers and Functional Relations" at the FU. She started a postdoc at the working group on Quantitative Methods in Educational Sciences, University of Potsdam, in October and is working with Martin Brunner and Franzis Preckel on a three-year project funded by the DFG to conduct big data meta-analyses of gender differences in students' achievement and achievement motivation based on large-scale assessments (see pp. 3 ff.).
- MPIB fellow *Verena Sommer* successfully defended her dissertation entitled "The Fidelity of Neural Representations Shapes Episodic Memory Across the Human Lifespan" at the FU. She is continuing her work at MPIB as a postdoc with Myriam Sander's Minerva Research Group Lifespan Age Differences in Memory Representations (LIME).
- MPIB fellow *Anna Thoma* received the Psychonomic Society's Graduate Conference Award for her abstract entitled "Modeling Strategy Use for Multiple-Cue Judgment in Groups."
- The Berlin fellows took part in online presentation training sessions with Steve Weir.
- The virtual LIFE Seminar "Education Across the Lifespan" is being taught by *Martin Brunner* and internal and external guests until February.
- To stay in touch with each other for some fun and relaxation, the Berlin fellows are planning a Virtual Christmas Party.

LIFE Michigan

- Fellow *Kristi Chin* has been awarded a Rackham Graduate Student Research Grant.
- Faculty *Thad Polk* has been named Samuel D. Epstein Collegiate Professor of Psychology.
- Faculty *Twila Tardif*, Director of the Center for Chinese Studies, has been named the Kenneth G. Lieberthal and Richard H. Rogel Professor of Chinese Studies.
- Faculty *Laura Zahodne* has won the International Neuropsychological Society's INS Early Career Award.

LIFE Virginia

- Faculty *Steve Boker* has been granted an honorary doctorate from the Universität der Bundeswehr München.
- *Steve Boker* is giving a Multivariate Analysis Class which is being followed with great interest by a considerable number of fellows from the other sites.
- Fellow *Meltem Yucel* was selected as a Student Affiliate to UNC-Chapel Hill's Center for the Science of Moral Understanding, directed by Kurt Gray. She has also won a $12,000 grant from Cornell University's Center for Social Sciences (CCSS) to conduct research on children's gossip. She has received the 1st Place Award and the People's Choice Award at the UVA's Three Minute Thesis Competition as well as being selected to participate in Harvard Kennedy School and Harvard Business School's Behavioral Insights Group Doctoral Workshop.

LIFE Zurich

- Fellow *Tabea Meier* successfully defended her dissertation entitled "Language Use and Socio-Affective Functioning in Adulthood: Adaptation and Functionality of Individual and Relational Language Markers in Different Interaction Contexts" in November. She has been awarded an Early Postdoc.Mobility fellowship by the Swiss National Science Foundation and will work with Claudia Haase (Human Development and Social Policy, and Psychology, Northwestern University, Evanston) to study emotional linkage in dyadic interactions across the lifespan from next summer onwards. Until then, she will continue her work as a postdoc at UZH.
- Fellow *Pia Neuschwander* successfully defended her thesis entitled "Hearing Loss Beyond the Cochlea: Neuroanatomical Characteristics of Peripheral, Central and Cognitive Hearing in Older Adults" in May and is now working at the University of Basel's Department of Clinical Research as a data scientist.

A spectacular view of the Milky Way above VLT. Source: https://www.eso.org/public/

Frequently used acronyms in LIFE

CRTD: Center for Regenerative Therapies Dresden

DIW: Deutsches Institut für Wirtschaftsforschung [German Institute for Economic Research]

DZA: Deutsches Zentrum für Altersfragen [German Centre of Gerontology]

FU: Freie Universität Berlin

HU: Humboldt-Universität zu Berlin

LIFE: International Max Planck Research School on the Life Course

UM: University of Michigan

UVA: University of Virginia

UZH: University of Zurich

MPIB: Max-Planck-Institut für Bildungsforschung [Max Planck Institute for Human Development]

LIFE Newsletter

Editor
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Aim of the newsletter
The LIFE newsletter encourages collaboration and interaction among people within the LIFE program. It provides an information platform where fellows, alumni, and faculty members can learn more about each other's research, and identify colleagues with similar interests and possible projects for collaboration.

Contributions
Please send contributions, suggestions, and input to the editor.

Publishing information
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