Tinder for orang-utans: comparing sexually selective cognition among Bornean orang-utans (Pongo pygmaeus) and humans (Homo sapiens)

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Table of contents

	Acknowledgements	5
	Table of contents	7
	Preface	11
Chapter 1	**General introduction**	15
	Sexual selection and the evolution of attractiveness	19
	Human mate choice	21
	Orang-utan socio-ecology	24
	Dissertation outline	25
Chapter 2	**"I go bananas for you": Extending sexually selective cognition to non-human primates**	29
	Abstract	30
	Introduction	31
	Sexually selective cognition in humans	33
	Sexually selective cognition in primates	41
	Opportunities for sexually selective cognition research in primates	43
	Future applications: sexually selective cognition and conservation breeding	46
	Conclusion	49
Chapter 3	**Multimodal mate choice: Exploring the effects of sight, sound, and scent on partner choice in a speed-date paradigm**	51
	Abstract	52
	Introduction	53
	Methods	56
	Results	61
	Discussion	64

Chapter 4 **Attractiveness modulates attention, but does not enhance gaze cueing** 69
Abstract 70
Introduction 71
Experiment 1 75
Experiment 2 83
Experiment 3 86
Discussion 91

Chapter 5 **Individual attractiveness preferences differentially modulate immediate and voluntary attention** 97
Abstract 98
Introduction 99
Method 104
Results 111
Discussion 118

Chapter 6 **No immediate attentional bias towards or choice bias for male secondary sexual characteristics in Bornean orang-utans (*Pongo pygmaeus*)** 127
Abstract 128
Introduction 129
Methods 132
Results 142
Discussion 146

Chapter 7 **Orang-utans like it cheeky: Attentional bias towards flanged males in Bornean orang-utans *(Pongo pygmaeus*)** 153
Abstract 154
Introduction 155
Method 158
Results 164
Discussion 169

Chapter 8 **Evidence of female proceptive behaviour and vocalisation during ovulation in two zoo-housed Bornean orang-utan (*Pongo pygmaeus*) females** 177

Abstract 178
Introduction 179
Method 181
Results 183
Discussion 191

Chapter 9 **General discussion** 197

Summary of main findings 199
Theoretical implications 204
Methodological considerations 210
Practical implications 213
Future directions 216
Conclusion 218

Appendices 221

Appendix A Supplementary Material for Chapter 2 222
Appendix B Supplementary Material for Chapter 3 224
Appendix C: Supplementary Material for Chapter 5 233
Appendix D: Supplementary Material for Chapter 6 244
Appendix E: Supplementary Material for Chapter 7 246
Appendix F: Supplementary Material for Chapter 8 251
Appendix G: model stability checks 252

Bibliography 261
Samenvatting 284
Curriculum vitae 290
List of publications 293

Preface

This dissertation is the result of a close collaboration between Leiden University, Apenheul Primate Park, and the European Endagered Species Programme (EEP) for orang-utans. In 2017, Thomas Bionda, Warner Jens (both Apenheul), and Mariska Kret (Leiden University) decided to team up with the goal of refining the orang-utan breeding programme by taking individual mate preferences into account. One promising approach to do this, was application of computerized tasks within the orang-utan breeding programme to identify such mate preferences in zoo-housed orang-utans. Until then, computerized tasks had mainly been used to study fundamental scientific questions. For instance, the bonobos (*Pan paniscus*) in Apenheul had been participating in multiple non-invasive experiments to study emotion perception (Kret et al., 2016; van Berlo et al., 2023). This research programme inspired the idea of finding a more practical application for such methods, in addition to fundamental questions.

One particular species for which such a practical application was considered useful was the orang-utan (*Pongo* spp.). Zoo-housed orang-utans have relatively low breeding success compared to other great ape species (Kaumanns et al., 2004), and their birth rate may have been too low to maintain a stable population size (Bemment, 2018). One potential reason for this is the solitary nature of orang-utans: they live a semi-solitary lifestyle (Roth et al., 2020), and group life may actually be a stressor for them (Amrein et al., 2014; Weingrill et al., 2011). At the same time, orang-utan females are known to be selective in their mate choice (Knott et al., 2009). This led to the idea of developing tasks that can assess orang-utan mate preferences, ultimately providing them with more control over their social environment, which could also lead to increased reproductive success. With this goal in mind, I started my PhD project in 2019, eventually resulting in this dissertation.

Currently, most captive breeding programmes do not take mate preferences into account, although a large body of literature shows that animals have higher reproductive success when allowed to choose their own mate (reviewed in Martin-Wintle et al., 2019). Instead, breeding recommendations are heavily based on genetic data and practical factors such as housing space. Admittedly, it has not been easy to incorporate mate preferences into breeding programmes: studies that find beneficial effects of incorporating mate choice often rely on behavioural measures during inter-individual interactions to identify mate preferences. Such methods are not feasible in zoo populations, where individuals are spread across multiple locations. This has led some authors to argue for long-distance

methods, that allow identification of mate preferences even when individuals are housed in different facilities (Asa et al., 2011). In line with this idea, the current dissertation explores whether simple cognitive tasks are suitable for identifying mate preferences of zoo-housed Bornean orang-utans (*P. pygmaeus*). As it is challenging to validate such methods in orang-utans (e.g., by linking them to reproductive success), similar cognitive tasks were presented to a human sample in combination with measures of explicit mate preferences. Although results from humans are not directly generalisable, this approach may help identifying tasks that have the *potential* to determine mate preferences in zoo-housed orang-utans.

Given that practical research with animals rarely receives funding via conventional funders, it has been challenging to obtain sufficient resources to realise the project. In the end, this project is made possible by generous donations from multiple zoos within the orang-utan EEP: Allwetter Zoo, Apenheul Primate Park, Dublin Zoo, Ouwehands Dierenpark, Taipei Zoo, Zoo Barcelona, Zoo Osnabrück, Zoologischer Stadtgarten Karlsruhe, Zoo Zürich, & Wilhelma Zoologisch-Botanischer Garten. Furthermore, it is important to note that this research project was heavily impacted by the COVID19 pandemic. Especially during the start, when the risk of COVID19 for great apes was still unclear, no risk was taken and experiments were halted. Not surprisingly, this has had a large impact on the amount of data that could be gathered with the orang-utans. Therefore, the results presented in this dissertation mostly focus on attentional tasks. However, we are still broadening our scope by running new studies on this topic and hope that this will allow us to develop multiple suitable tasks encompassing different aspects of mate choice in the future, resulting in a more refined breeding programme.