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研究課題名（和文）Toward an Evolutionary Thanatology

研究課題名（英文）Toward an Evolutionary Thanatology

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研究成果の概要（和文）：1. ヒト以外の霊長類における「死臭」（ブトレシン）に対する反応に関する最初の実験的研究。チンパンジーがヒトと同様にこの匂いを嫌悪的に感じる。2. 霊長類以外の動物において、死んだ動物の写真と生きている動物の写真の弁別を調べた。弁別の証拠は見つからなかった。3. 生物または動くロボットが関係する「致命的な」事故が描かれたアニメーションに対する子供の説明に関する研究。言語反応と眼球運動、生理学的測定を組み合わせる。4. 子供の死に関する理解についての親の推定についての研究。このオンライン研究で、ペットの飼育などの経験の影響も明らかにする。5. 日本人と欧米人の安楽死に対する考え方を比較した。

研究成果の学術的意義や社会的意義

This research has led to new findings in the field of comparative developmental thanatology, stimulating other research teams to conduct related research and develop new approaches in humans and other species of animals. The work has attracted considerable international media attention.

研究成果の概要（英文）：Main research achievements are: 1. First experimental study on responses to a "death odor" (putrescine) in nonhuman primates. We have shown that chimpanzees resemble humans in finding this odor aversive. 2. First exploration of spontaneous discrimination between pictures of dead and live animals in nonhuman primates (capuchins). We found no evidence of discrimination, and will follow up with a learning task. 3. First study of children's descriptions of animated films showing a "fatal" accident involving a living being (chimpanzee) or a moving, non-living object (robot). Verbal responses are combined with eye-movement and physiological measures. 4. First quantitative study of the accuracy of parents' estimations of their children's understanding of death and children's actual estimations. This large online study also clarifies the influence of experiential factors such as owning a pet. 5. First formal comparison of attitudes towards euthanasia between Japanese and Western (UK) people.

研究分野：Psychology

キーワード：death dying cognition emotions nonhuman primates children attitudes euthanasia

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1. 研究開始当初の背景 Background at the beginning of the study

Since around 2010 the number of reports on responses of various species of animals to dead and dying members of their group or species has increased remarkably. Although some experimental studies had been done, for example on responses to death and cues of death in insects and birds (especially crows), there was a striking absence of controlled studies in our nearest evolutionary neighbours, namely monkeys and apes. Also, whereas developmental (and sometimes clinical) psychologists in western countries had been working on how children progress to an adult-like concept of death through mastering four major subcomponents of this concept, no similar research efforts were to be found in the literature on psychological development in Japanese children. The scene was therefore set for looking at various death-related issues from a “comparative evolutionary” perspective. The present project aimed to investigate psychological mechanisms involved in dealing with and understanding death in nonhuman primates, and also in Japanese children, for a developmental perspective.

2 . 研究の目的 Purpose of the study

The purpose of the study was to design and conduct new studies to bring new findings and fresh perspectives to the study of children’s and nonhuman animals’ responses to and understanding of death.

3 . 研究の方法 Methods of the study

The project included five separate studies, as follows: (1) chimpanzees’ responses to putrescine; and (2) capuchin monkeys’ responses to photos of live and dead animals. These experiments used simple measures (frequencies, durations, bout lengths) of proximity (chimpanzees) and visual attention (capuchins) to relevant stimuli. The chimpanzee study was conducted at the Kumamoto Sanctuary, and the capuchin study was conducted in the animal laboratory at the Graduate School of Letters. For the chimpanzees, the stimuli were a taxidermy small bird and a similar sized glove, each presented individually and paired with water, ammonia, or putrescine. For the study with capuchins, the stimuli were 60 colour photographs of live animals (mammals and birds, namely: cats, foxes, sheep, sparrows, pigeons, budgerigars), and 60 matched photographs of dead animals belonging to the same species. In each study, the stimuli were presented over repeated sessions to obtain a sufficiently large database for statistical analyses (using parametric and non-parametric tests, as appropriate).

(3) A study of children’s responses to animated video scenes depicting a “fatal” accident (falling off a ladder) befalling a chimpanzee or a robot was conducted with the participation of 60 children

(20 at each of ages 4, 5 and 6 years). Individually tested children watched each scene on a large video monitor, during which the child's eye movements were recorded using a Tobii eye-tracker while their heart rate and body temperature were monitored using unobtrusively applied sensors. After watching each scene (order of presentation was counterbalanced), children were asked to describe what happened in the scene, with several pre-prepared questions about whether the chimpanzee/robot was dead or alive, and whether it could breathe, move, waken up, etc.

(4) A study of the development of the death concept in Japanese children and their parents' estimations of their children's understanding was conducted online, using a professional survey company. The PI and colleagues designed an original questionnaire with key items to elicit children's answers reveal their knowledge concerning the four major sub-components of the death concept: universality, irreversibility, non-functionality, and causality. First, each child's parent completed the questionnaire online, estimating **what answer they thought their child would give**. The parent also provided background information such as number of children in the family, the child's experience of death of a family member, neighbour, or pet, past discussions about death, etc. The parent then verbally asked the child each of the key questions, and entered the child's response online, along with any specific comments by the child. Valid data were obtained from 177 children spanning four ages groups: 4, 6, 8 and 10 years, and their caregivers (mother or father).

(5) A cross-cultural study of attitudes towards euthanasia was conducted online, using a professional survey company. One hundred adults (all dog owners) registered with the company in Japan and 100 in the UK volunteered to participate and provided valid data. The PI and colleagues designed a questionnaire to assess people's attitudes in the two countries towards euthanizing pet dogs in the event of terminal illness or life-changing injury. Questions were also included that covered religious and philosophical beliefs about death and dying, and attitudes towards euthanizing of other (non-domesticated) species of animals.

4. 研究成果 Achievements

1) Responses to a "death odor" (putrescine) in chimpanzees

For the first time, we demonstrated experimentally that at least some nonhuman primates (specifically, chimpanzees), take action to escape from the odor of putrescine, one of the main components of the "smell of death" emanating from mammalian corpses. Chimpanzees were likely to withdraw from a dead (taxidermy specimen) of a bird or a control object (glove) paired with putrescine than the same object paired with water or ammonia (Anderson, Heow & Hirata, 1921) (see Fig1. 1). This finding, published in a peer-reviewed journal, opens up the way for further studies of the influence of putrescine and related "necromones" (e.g., cadaverine) in other species, including possible social effects such as outgroup discrimination. It can also be of use for examining the reactions of free-ranging groups and individuals to corpses encountered in their natural

environments.

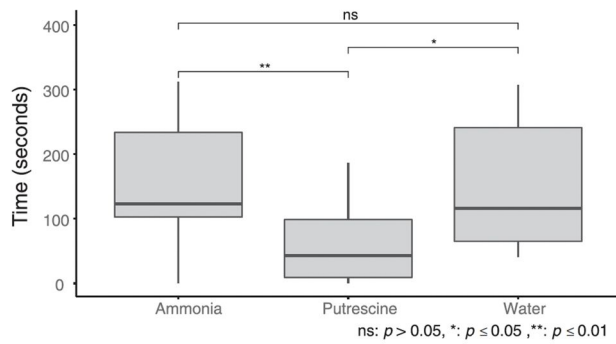


Figure 1. Time spent by chimpanzees in proximity to an object associated with the odor of ammonia, putrescine, or water.

2) Spontaneous responses to pictures of dead and live animals in capuchin monkeys

To our knowledge, this was the first attempt to explore whether spontaneous discrimination between visually presented live vs dead animals (in photographs) can be observed in any animal species. Capuchins were videotaped during presentation of photos, and then using repeated measures analyses of variance, we analyzed the monkeys' overall frequencies and durations of presentation-time looking at each stimulus, as well as the mean bout length of looking. We found no evidence of overall discrimination between dead and live pictures, or discrimination within animal categories. Despite yielding a "negative" result, this experiment is potentially informative for researchers interested in the nature of monkeys' and other animals' visual processing of "dead" vs "live" organisms. Before submitting the write-up for publication, we will add further data, most likely from an experiment based on monkeys' ability to match to sample photograph with the categorically similar (i.e., "dead") picture of two alternative stimuli (the second alternative being "live"). The PI aims to run this experiment in the second half of 2023.

3) Children's perception of animated films showing a "fatal" accident befalling a chimpanzee or a robot

Working on the hypothesis that young children perceive a chimpanzee as "living" and a robot as "inanimate" (albeit an object capable of movement), we combined collecting data on children's verbal descriptions of the contents of the video sequences of the chimpanzee and robot falling from high up a ladder, with eye-movement and physiological measures. Although the earliest-starting of the project's studies involving children, due to the covid pandemic and subsequent restrictions on receiving children on campus, this experiment finished only in March 2023. We will shortly begin to analyze the children's verbal responses to questions about the events depicted in the videos, and consult with colleagues responsible for the handling the eye-tracking and physiological measures, with a view to publishing this unique set of data in a timely manner.

4) Quantitative study of the accuracy of parents' estimations of their children's understanding of death and children's actual estimations

In the first study of its kind, parents provided answers that they thought their children would give to verbal questions designed to gauge children's understanding of four major components of the typical adult's concept of death: universality, irreversibility, non-functionality, and causality. After completing these questions and others relating to background information such as education level, the child's experience of someone close or a pet dying, parent-child discussions about death, etc., the parent presented the questions to the child verbally, and recorded the child's responses on the online questionnaire.

The data from this study are currently being analyzed and the first formal presentation will be made at an international conference in June, with a manuscript in preparation for submission to a journal to follow.

GLMM analysis of children's responses indicated a significant main effect of age on Japanese children's developing concept of death. In particular, there were significant shifts between the ages of 4 and 6 years towards correct understanding of non-functionality and the universality of death. Notably, however, there was a significant downward shift in the latter variable between ages 8 and 10. Perhaps surprisingly, for parents' estimates of their children's understanding of each component, there were no significant differences related to children's age. This indicates that what parents think their children understand about death and the children's actual understanding may be different. We are continuing to scrutinize the data to reveal more about the parent-child discrepancies and the developmental changes observed.

5) Cross-cultural comparison of attitudes towards euthanasia: Japanese and British pet (dog) owners.

The results of our preliminary analyses strongly support our predicted difference: Japanese people are strongly disinclined to authorize the ending of an animal's life even in cases where the animal may have a terminal disease or be infirm due to accident or old age, whereas the western sample was much more likely to opt for euthanizing. While we believe that this difference in end-of-life decisions reflects the influence of religion, the participants' answers to background questions about their religious beliefs and attitudes towards death in general indicate few points of divergence between the two populations. These data will be written up and submitted for publication in the 2nd half of 2024.

5. 主な発表論文等

〔雑誌論文〕 計7件（うち査読付論文 5件/うち国際共著 5件/うちオープンアクセス 1件）

1. 著者名 Bin Yang, James R. Anderson et al.	4. 巻 64
2. 論文標題 Leopard predation on wild Sichuan snub-nosed monkeys	5. 発行年 2023年
3. 雑誌名 Primates	6. 最初と最後の頁 589-594
掲載論文のDOI（デジタルオブジェクト識別子） 10.10907/s10329-023-01084-7	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

1. 著者名 Bin Yang, James R. Anderson, Min Mao et al.	4. 巻 12
2. 論文標題 Maternal caretaking behavior towards a dead juvenile in a wild, multi-level primate society	5. 発行年 2022年
3. 雑誌名 Scientific Reports	6. 最初と最後の頁 1-8
掲載論文のDOI（デジタルオブジェクト識別子） 10.1038/s41598-022-08660-9	査読の有無 無
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 -

1. 著者名 Anderson, JR; Yeow, H; Hirata, S	4. 巻 193
2. 論文標題 Putrescine-- a chemical cue of death-- is aversive to chimpanzees	5. 発行年 2021年
3. 雑誌名 Behavioural Processes	6. 最初と最後の頁 104538
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.beproc.2021.104538	査読の有無 有
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1. 著者名 Yang, B; Anderson, JR; Mao, M; Wang, K; Li, B	4. 巻 12
2. 論文標題 Maternal caretaking behaviour towards a dead juvenile in a wild, multi-level primate society.	5. 発行年 2022年
3. 雑誌名 Scientific Reports	6. 最初と最後の頁 4780
掲載論文のDOI（デジタルオブジェクト識別子） 10.1038/s41598-022-08660-9	査読の有無 有
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1. 著者名 Anderson, JR	4. 巻 61
2. 論文標題 Responses to death and dying: Primates and other mammals	5. 発行年 2020年
3. 雑誌名 PRIMATES	6. 最初と最後の頁 1-7
掲載論文のDOI (デジタルオブジェクト識別子) 10.1007/s10329-019-00786-1	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

1. 著者名 Pettitt, P; Anderson JR	4. 巻 61
2. 論文標題 Primate thanatology and hominoid mortuary archeology	5. 発行年 2020年
3. 雑誌名 PRIMATES	6. 最初と最後の頁 9-19
掲載論文のDOI (デジタルオブジェクト識別子) 10.1007/s10329-019-00769-2	査読の有無 有
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1. 著者名 Pettitt, P; Anderson JR	4. 巻 61
2. 論文標題 Primate thanatology and hominoid mortuary archeology	5. 発行年 2020年
3. 雑誌名 PRIMATES	6. 最初と最後の頁 9-19
掲載論文のDOI (デジタルオブジェクト識別子) 10.1007/s10329-019-00769-2	査読の有無 無
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〔学会発表〕 計7件 (うち招待講演 3件 / うち国際学会 2件)

1. 発表者名 James R. Anderson
2. 発表標題 Why is there no suicide in nonhuman primates?
3. 学会等名 Scottish Primate Research Group Meeting (国際学会)
4. 発表年 2023年

1 . 発表者名 James R. Anderson
2 . 発表標題 Why there is no suicide in nonhuman primates
3 . 学会等名 Scottish Primate Research Group, Burn Meeting
4 . 発表年 2023年

1 . 発表者名 Anderson, JR
2 . 発表標題 Mirrors, yawns, and death: Connections?
3 . 学会等名 15th International Symposium on Primatology and Wildlife Science
4 . 発表年 2021年

1 . 発表者名 Anderson, JR
2 . 発表標題 Mirrors, yawns, and death: Connections?
3 . 学会等名 15th International Symposium on Primatology and Wildlife Science (招待講演)
4 . 発表年 2021年

1 . 発表者名 James R. Anderson
2 . 発表標題 Captive primates and stress: self-aggression, self-injurious behaviour, but no suicide: Why?
3 . 学会等名 14th International Conference on Environmental Enrichment (招待講演) (国際学会)
4 . 発表年 2019年

1. 発表者名 James R. Anderson
2. 発表標題 Self-injurious behaviour and suicide: humans vs. aped, and the imaginary vs. the real self.
3. 学会等名 Skills of Feeling with the World- Fifth Workshop (招待講演)
4. 発表年 2020年

1. 発表者名 James R. Anderson
2. 発表標題 Why is there no humans-like suicide in animals?
3. 学会等名 Third Kyoto Workshop on Evolutionary Thanatology: Death in Non-humans, and Human Perspectives
4. 発表年 2019年

〔図書〕 計2件

1. 著者名 Anderson, JR	4. 発行年 2020年
2. 出版社 Evolutionary psychology and thanatology: Responses to death.	5. 総ページ数 504
3. 書名 The SAGE Handbook of Evolutionary Psychology	

1. 著者名 James R. Anderson	4. 発行年 2019年
2. 出版社 Academic Press	5. 総ページ数 6
3. 書名 Encyclopedia of Animal Behavior, 2nd Edition	

〔産業財産権〕

〔その他〕

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6. 研究組織

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
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7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8. 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関
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