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Original Research Paper

Chimpanzees behavioral response to a shift in number of visitors during autumn holiday in Aalborg zoo

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Abstract

This study examine how the number of visitors affects the behavior of four chimpanzees *Pan troglodytes* in Aalborg Zoo. Overall, continuous focal sampling showed no significant changes in the chimpanzee's behaviors that could be linked to the number of visitors. However, the youngest individual showed significant more shifts in behavior during holidays than during the control days. Individual differences were found in behavioural interactions, fouraging and stereotypical behavior.

Keywords: animal personality, captivity, behaviour, welfare, *Pan troglodytes*

Introduction

Natural Environment For Chimpanzees

Chimpanzees (*Pan troglodytes verus*) live in numerous different habitats throughout the equatorial part of Africa (Stanford, 1998). The natural habitat of chimpanzee vary from deep forests to open mixed forest-savannas in both lowlands and in relatively high altitudes (AZA Ape TAG, 2010). The size of the chimpanzee's communities in the wild are determined by their habitat, such as the density of the forest and the accessibility to food. The distribution of females and males in wild chimpanzee communities are typically relatively even (AZA Ape TAG, 2010). Boesch (1996) studied the group size of several wild chimpanzee communities, and found a mean group size of 5.7 individuals. However, the size of chimpanzee communities may be as large as 20-100 individuals (AZA Ape TAG, 2010). Chimpanzees are living in societies with competition among goup members as well as between groups, but also with high level of cooperation between individuals (de Waal, 2005).

Chimpanzees In Captivity

Chimpanzees in zoos play an important role in species conservation by acting as ambassadors for their wildliving counterparts. Captive chimpanzees are used for education and research, and as genetically population assurance if the wild population gets critically low (Ralls and Ballou, 1992; Lecturer and Booth, 2013; Penfold et al., 2013; Skibins and Powell, 2013). The western chimpanzee is losing its habitats, including rainforest and savanna woodland habitat. Chimpanzees are still hunted illegally primarily for food and because they may damage crops, and especially infant chimpanzees are caught and traded by wildlife dealers (Kühl et al., 2017).

Knowledge and understanding of the natural behaviour of animals in zoos is important in order to secure the wellbeing of animals (Kreger and Mench, 1995; Hosey, 2005). One way to achieve welfare for captive animals is to secure acess to natural behaviour as e.g. foraging and interact with conspecifics and to avoid stress from a changing environment. Across varying animal species research has shown that deprivation of behaviour, typical for the species, is correlated with reduced welfare e.g hens deprived of sand to dust bath can lead to self- or allopecking (Vestergaard and Lawson, 1997; Clubb and Mason, 2006; Pomerantz and Terkel, 2013; Cronin, West and Ross., 2016). Studies show that wild chimpanzees spend about half of their life sleeping and resting, therefore captive chimpanzees must be provided with elevated sleeping platforms or beds and bedding material that contributes to appropriate sleep (Pruetz and McGrew, 2001). Chimpanzees in the wild live in fission-fusion social systems in contrast to the relatively permanent social groups in most zoos (Pruetz and McGrew, 2001). According to AZA Ape TAG, (2010) chimpanzee groups should consist of multi-male/multi-female groups and newly established groups are recommended to contain three males and five females (AZA Ape TAG, 2010). Another way of increasing the well being of captive individuals is enrichment of their experienced environment as for example placing objects that invite to tool-use, object-play, or foraging (Wood, 1998). As vision is essential in social and non-social life in most primates, recent research efforts have furthermore explored the effects of visual enrichment in orangutan (Pongo pygmaeus) (Garcia et al. 2020). For the well being of chimpanzees the access to outdoor facilities seems crucial judging from their behaviour and utilisation of physical features (AZA Ape TAG, 2010; Martínez, 2014). Clarke and Maple (1982) found a large reduction in stereotyped and self-directed behavior, after translocation to a naturalistic island from laboratory environments. Another study showed a decrease in attention behaviors (towards visitors) and abnormal behavior for chimpanzees when translocated from an indoor hardscape-type exhibition to a naturalistic enclosure with access to outside areas, while gorillas showed reduced agonism and attention behavior (Ross et al., 2011). The complexity and features of the enclosure seems to be more important than the space itself when creating functionally appropriate captive environments (Webb et al., 2018). It is important that the design contribute to that the chimpanzees have control over their environment by providing the opportunity for the chimpanzees to choose microenvironments (AZA Ape TAG, 2010). Hiding places are both intended to escape conspecifics and to block the view by visitors.

Several studies indicate that visitors may be a source of stress for animals, depending on the species and the behaviour of visitors (Fernandez et al., 2009). Carder and Semple (2008) found a positive association between self-scratching and number of visitors for gorillas and Wood (1998) found that many visitors caused a decrease in frequencies of foraging, grooming, play and object-using . Multiple studies indicate that zoo visitor presence, density, activity, size and position are linked to specific animal behaviour. Previous studies interpret that visitor's effect on animals can be both negative and enriching (Davey, 2007). Thompson (1976) found that sexual behaviour between chimpanzees increased when zoos visitor numbers were higher. Hosey and Druck (1987) studied 12 captive primate species, they observed that visitor presence had an effect on mobility and spatial dispersion, it was also noticed that primate behaviours was mostly directed at active visitor groups instead of the passive (Davey, 2007).

Captive chimpanzees have behaviour that is considered as abnormal. The abnormal behaviour varies but indicate possible signs of poor mental health (Birkett and Newton-Fisher, 2011, Pomerantz et al., 2013). Captive environments often lead to abnormal behaviour in several species (Birkett and Newton-Fisher, 2011). Studies shows consideratble individual variation in stress physiology (Carere et al., 2010). Inheritage and accumulated experiences through lifetime espressed as for example aggression, boldness, fearfulness, cooperativeness, and exploration tendencies may influence the behaviour of individual chimpanzees to

different kind of disturbance from their invironement (Wolf and Wessing, 2012; Dingemanse and Reale, 2005).

The aim of this study is to evaluate a number of different behavioural expressions of four chimpanzees, housed at Aalborg zoo, in response to the number of visitors.

Methods

Subjects

This study concern the behaviour of four chimpanzees, housed in Aalborg zoo. The chimpanzee, Jutta is 45 years old and the mother of the other three chimpanzees; My a female, age of 7, Sebastian a 12 years old male, Laura a 25 years old female. Jutta was born in Africa but was moved to Aalborg Zoo when she was about 6 years old, the other chimpanzees are all born in Aalborg zoo.

Enclosure

The chimpanzee enclosure consists of an outside area around 125 m2, and an inside area around 100 m2. Both areas contain several large rocks and a large climbing tree with vertical and horizontal trunks and ropes between them allowing the chimpanzees to climb (Appendix A). Both areas have containers with small holes, containing oatmeal, for which the chimpanzees must use tools to get. In the outside enclosure there is a tire swing, a shelter, and multiple trunks on the ground. The inside area also contains wooden platforms and bedding material. Despite the are between the indoor and outdoor enclosure, the enclousures does not contain covers where chimpanzees can hide from the observing visitors.

Procedure

The behavioural observations were collected between 9.00 and 16.00 every day in two periods: 1) The 30/9 to the 6/10 and 2) The 14/10 to the 20/10. Chimpanzees in Aalborg Zoo are fed between 9.00-10.00 and is open to visitors from 10-16 on weekdays and from 10-17 on holidays and weekend. The first period was a normal week and served as a control week. The second period was Autumn holiday, where the number of guests was 32% higher compared to the control week. The chimpanzee behaviour was recorded based on an ethogram constructed by the aid from the zookeepers as well as own observations of the chimpanzees e.g. passive behaviour, movement, foraging, reaction to guests or zookeepers, abnormal behaviour and interaction (Appendix B).

The behaviour of the chimpanzees was collected by using five cameras (ANNOX outdoor action and y-cams); three overlooking the outdoor area and two the indoor area. It was not possible to record the area between the outdoor and indoor part of the enclosure, hence chimpanzees that stayed in this area were not recorded. During the control week period 1) the chipanzees were video recorded September 30th, October 2nd and 5th and in during Autumn holiday 2) period the chipanzees were video recorded October 16th, 18th and 20th. Three independent researchers watched the recorded videos separately, discussed discrepancies and guidelines for the behavioural tendencies in order to standardize the ethogram. In addition a correlation test was made in Past to secure that recordings were made in the same way by different observers. While watching the recorded videos the start- and stop points for all behavioural tendencies was noted in Excel. It was converted to seconds after 9.00 AM and afterwards calculated to intervals of each behaviour.

Data Analysis

All statistical tests were made using the free statistical software program "Past" (Hammer et al., 2001). Behavioral observations were used to: 1) examine if there was an overall difference in how the chimpanzees behave between the control week and the holiday week. 2) to examine if there was an individual difference in the behaviour of the chimpanzees between the control week and the holiday week.

The average time when chimpanzees were "out of view" in all collected data was 21.8 %. Prior to the analysis the data were tested for normal distribution with Shapiro-Wilks test (Zar, 1999). As some data were not normally distributed non-parametric tests were used. Level of significans was < 0.05.

Pairwise comparisons between behavioural recordings in period 1) the control week- and 2) Autumn holiday was made borth for each individual separatly and pooled for all four individuals behavioural.

Comparisons were tested using Kruskal Wallis and Mann-Whitney pairwise tests (Mann, 2013; MacFarland and Yates, 2016). The correction for multiple comparisons were not corrected because of the reduction in statistical power and the increased possibility for a type two error as the observations were not independent (Nakagawa, 2004). The differences in skewness and kurtosis were checked comparing bootstrap confidence intervals between the groups. To illustrate the differences in behaviour between the chimpanzees, figures were made for the medians, interquartile range, skewness and kurtosis in Excel. Furthermore, cumulative frequency curves were made to estimate how each behaviour was distributed during the day for each chimpanzee (Appendix C).

The percent of the total time consumption of each behaviour for either the control or the holiday was tested for significant differences by a c2 test in Past.The variance was calculated by the interquartile range (IQR); removing data outside the 25th and 75th percentiles, prior to Levene's test.

A shift from one behavior to another is defined as when the chimpanzee stops one type of behavior and begins with another.

Results

The only behavioural interaction that differed between the individuals in both control week and holiday week was the percentage of time spent with interaction. Jutta spent significantly more time interacting with other individualss than her offspring in the control week and also than Sebastian in the holiday week. Only My spent significantly more time with interaction than Jutta during the holiday week (Appendix D).

Number of visitors did not affect behavior of chimpanzee significantly

Comparisons of behavioural expressions between the days of control and holiday show no clear tendencies for the medians, IQR, skewness and kurtosis. Although significant individual behavioural differences were found in the data, no overall consensus in significant difference for median, IQR, skewness and kurtosis was found when comparing control days and holidays (Appendix E and F). Hence, the number of visitors is not the main determinant for the significant differences that was observed between control and holiday.

Individual differences in behaviour of the four chimpanzees

Passive behaviour (Figure 1). My showed significantly lower median passive behaviour than Jutta and Sebastian during the holidays (Figure 1.A). My's and Laura's IQR was significantly lower than that of Sebastian's and Jutta's during the control days. Jutta´s IQR was significantly higher than that of the rest of the chimpanzees during the holidays. Laura's IQR was significantly lower than Sebastian's and My's during both control days and holidays (Figure 1.B).

Moving behavior (Figure 2). There is significant difference in the time spendt moving between My and Jutta for both the control days and the holiday. In the control week the median for moving is lowest for Jutta, whereas in the holiday the median for moving is higher than that of My (Figure 2.A). Laura and Jutta's skewness and kurtosis are significantly lower than both My's and Sebastian's skewness and kurtosis for the control (Figure 2.C and 2.D). In the control days the IQR for movents for My is significantly higher than the other chimpanzees. Laura's IQR movements is also significantly lower than Jutta's and Sebastian's IQR for the control. Laura's IQR is significantly lower than the others for the holiday (Figure 2.B).

Fouraging behaviour Figure 3. Jutta's fouraging median is higer than that of the other chimpanzees and significantly higer during the holiday week. The median for Jutta is significantly higher compared to Sebastian's and My's during the control week. My's median fouraging behaviour is significantly lower than Laura's during the control week. (Figure 3.A). My's IQR is also significantly lower than the others in the control week and Laura's and My's IQR significantly lower than Jutta and Sebastian during the holiday week (Figure3.B).

Reaction to guests or zookeepers (Figure 4). Jutta's reacts less to presence of guests and zookeepers (median is significantly lower) than My's in the control week. During the holiday, Sebastian's median is significantly lower than Jutta's (Figure 4.A). Also IQR of Sebastian is significantly higher than Jutta's during the control week. Jutta's IQR is significantly higher than Sebastian's during for the holiday (Figure 4.B). Laura was excluded from figure 4 due to lack of data.

Stereotypic behaviours (Figure 5). My was less stereotypic than Jutta and Laura (median of My significantly lower than Jutta's and Laura's) both in the control week and during the holidays. Also, My's IQR was significantly lower than the others during the control week. Jutta's IQR is significantly higher than My's in the holiday (Figure 5.B) Sebastian is excluded in stereotypic behaviour due to lack of data.

Behavioural interactions (Figure 6). Laura spent longer time interacting than the other chimpanzees. Laura's median was significantly higher than Sebastian's and My's. During the holiday My's median was significantly lower than Jutta's and Laura's. Laura's median is significantly higher than Sebastian's median (Figure 6.A). Laura's IQR and kurtosis was significantly lower than Sebastian's in the control week (Figure 6.D). Sebastian's IQR was significantly lower than Jutta's and Laura's in the holiday (Figure 6.B).

Laura's number of behavioural shifts were significantly higher than Sebastian's and lower than My's in the control week. In addition, Laura's number of behavioural shifts were significantly higher than Jutta's and Sebastian's in the holiday. My's number of behavioural shifts was significantly higher than the others during the holiday (Appendix J).

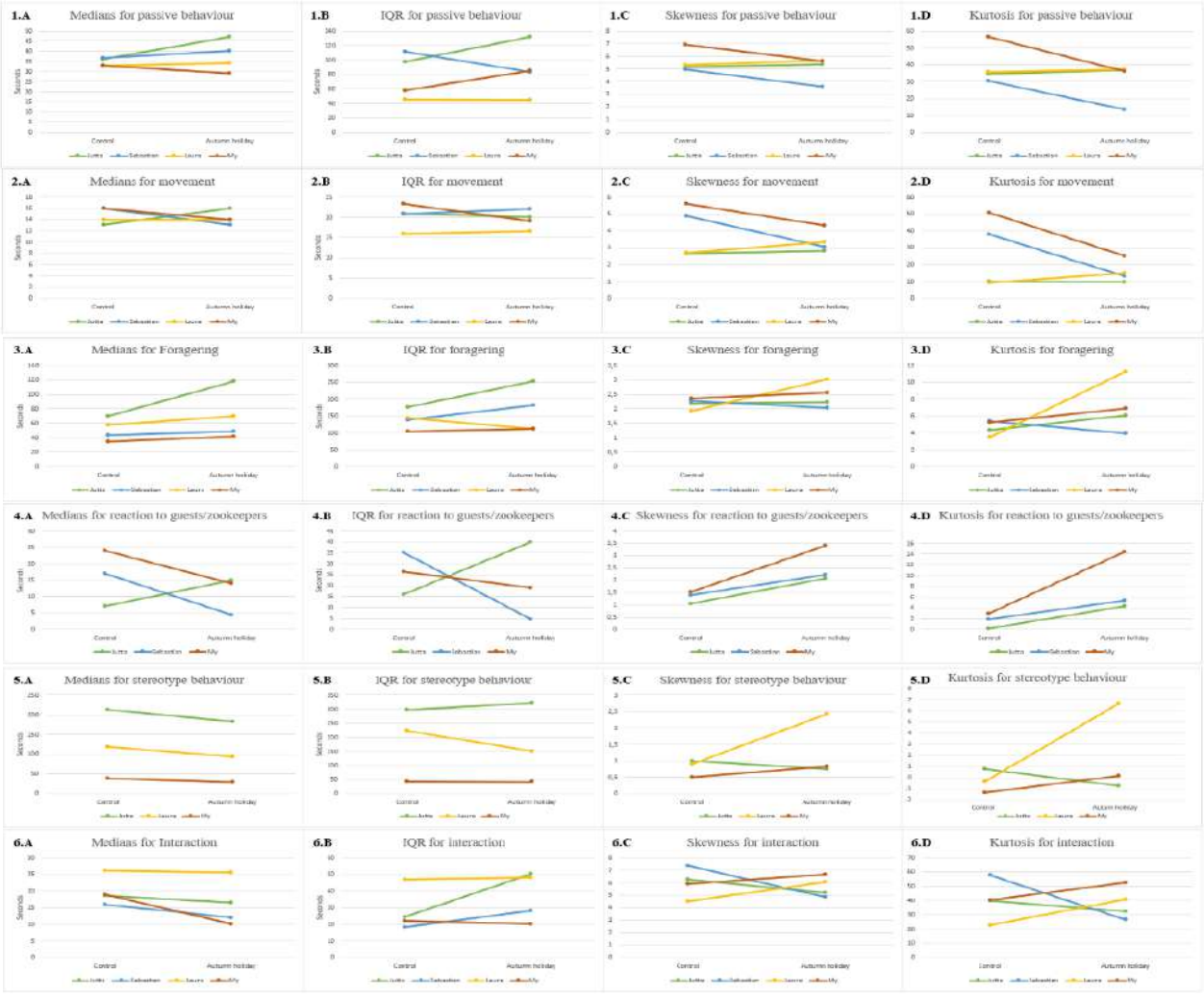

Figure 1-6 show the different behaviours; 1) passive behaviour, 2) movement, 3) foraging, 4) reaction to guests/zookeepers, 5) stereotype behaviour and 6) interaction.

All the figures show a) medians, b) interquartile range, c) skewness and d) kurtosis for the behaviour in the control week and the autumn holiday for the four chimpanzees (For further details see Appendix G and H).

Discussion

No changet in Behaviour As A result Of An Increase In Visitors

Even though there were 32% increase in the number of visitors during the holiday week this study found no clear patterns indicating that the number of zoo visitors had an effect on the behaviour of the chimpanzees. Several studies found that zoo visitor's presence, density, noise and activity have an influence on animal behaviour (Davey, 2007; Fernandez et al., 2009; De Azevedo 2012; Quadros et al., 2014). Larsen et al. 2014 found that noise influenced koalas making them more vigilance and Mitchell et al. (1992) found that if there was a large active audience primate's behaviour were directed at them.

Individual Variation In Behaviour Of The Four Chimpanzees

One of the most notable results found was that My generally performed significantly more shifts in behaviour i.e shorter behaviour intervals (Appendix J) and Jutta´s higher percent interactions compared to her offspring (Appendix D). This may be due to age, individual behavioural trends and Jutta´s role as a mother. When chimpanzees reach adolescence, spontaneous behaviour tend to decrease (Schrier and Stillnitz, 1974). Another reason could be her young age because play frequency decreases from puberty and is approximately proportional to increasingly longer and more intense grooming sessions (Van Lawick-Goodall, 1968).

Jutta´s more interactive behavioural may be due to her role as a mother and her higher rank. Female primates with high rank has previously been shown to receiving more grooming than others (Seyfarth, 1977; Tiddi et al. 2012). Jutta's significantly long foraging time may be explained by ther older age. Logan and Sanson (2002) found that koalas (*Phascolarctos cinereus*) compensate for tooth wear by increased food intake (enhanced average number of consumed leaves, daily chews and feeding time) and King et al. (2005) found that sifakas with tooth wear had a poorer reduction in particle size in dentally sentence compared to conspecifics in dental prime.

Although, Birkett and Fisher-Newton (2011) found that variation in stereotypic behaviour could not be explained by age, My´s significantly less stereotypic behaviour, may be explained by her young age. In our study there was tendency for the youngest chimpanzee being less stereotypic than the older chimpanzees. Stereotypic behaviour may be caused by boredom, restlessness and fatigue contray to more spontaneous and playfull behaviour in young chimpanzees. However, stereotypic behaviour may also be related to differences in personalities. Maternal separation cause stereotypical behaviour (Birkett and Fisher-Newton 2011). Jutta was transferred to Aalborg zoo when she was only six years old and may have been separated from her mother in a young age. As Jutta was born in Africa, in a different environment, while the other three chimpanzees are born in Aalborg zoo, may also have affected Jutta´s behaviour.

Conclusion

This study revaled no significant differences in the behaviour of the chimpanzees related to an increase in the number of visitors in Aalborg Zoo during Autumn holiday. Individual behavioural differences were found in interaction behaviour, fouraging behaviour and stereotypic behaviour. This may be explained by the age or individual behavioural trends in the four chimpanzees.

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Author´s Contrinutions

All authors contributed equally.

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Appendix A
Chimpanzee enclosure

Appendix B

Ethogram

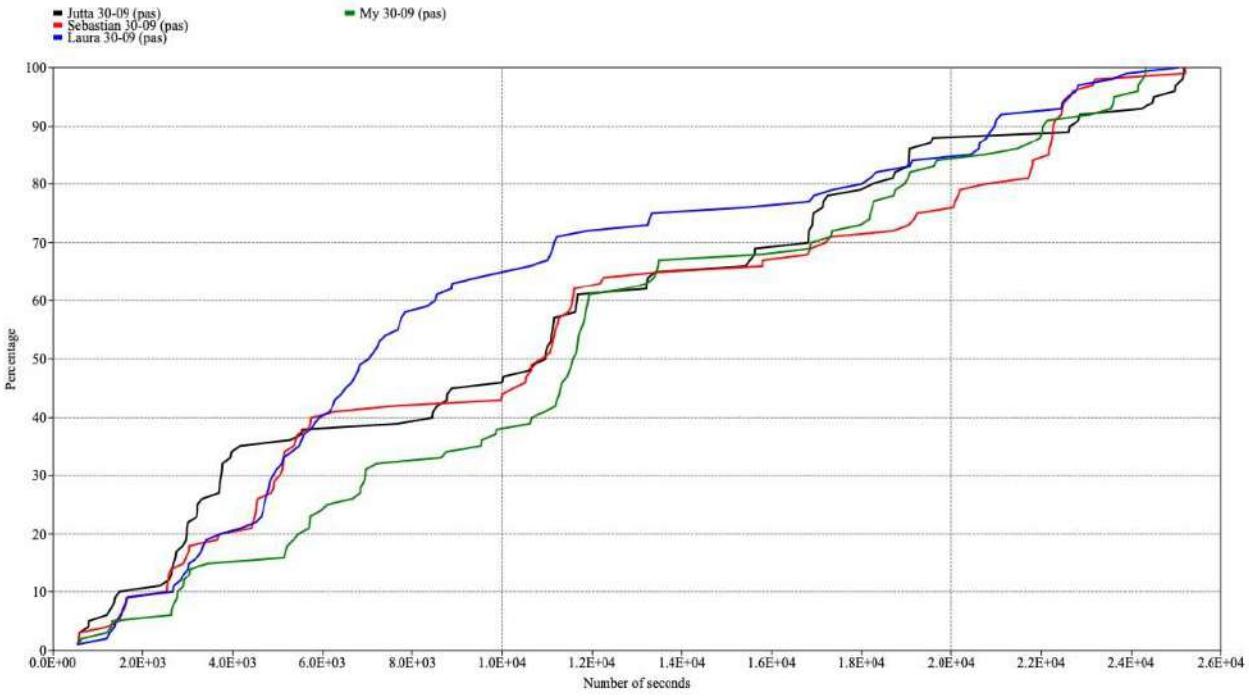
Passive behaviour	Sleep, rest, limited movement. It is okay for the chimpanzee to sit and handle objects, to stand up and look around and take two steps maximum, if they afterwards is passive again. If they are partly 'out of view', but most of chimpanzee is visible it is okay to note the behaviour as 'passive behaviour', as well if it sits with the back towards the camera, but it is clear that the chimpanzee do not perform any other behaviours.
Movement	Movement, walking, running (with or without objects), swinging in the tireswing, playing alone and climbing trees or rocks. It is okay for the chimpanzee to perform 'passive behaviour' if it do not exceed 10 seconds, if they afterwards moves again.
Foraging	Food intake, drinking, putting stick into the container with holes to eat the content. The behaviour 'foraging' starts at the point the chimpanzee touch the food item. It is okay for the chimpanzee to move from one food item to another and move while eating (foraging is considered higher ranking than movement).
Reaction to guests/zookeepers	Activity related to guests or zookeepers, banging on rocks or the walls.
Stereotype behaviour	Coprophagy, lubricating feces out on objects
Interaction	Not necessarily positive interaction between individuals, grooming, breeding behaviour, greetings, dominant/submissive behaviour

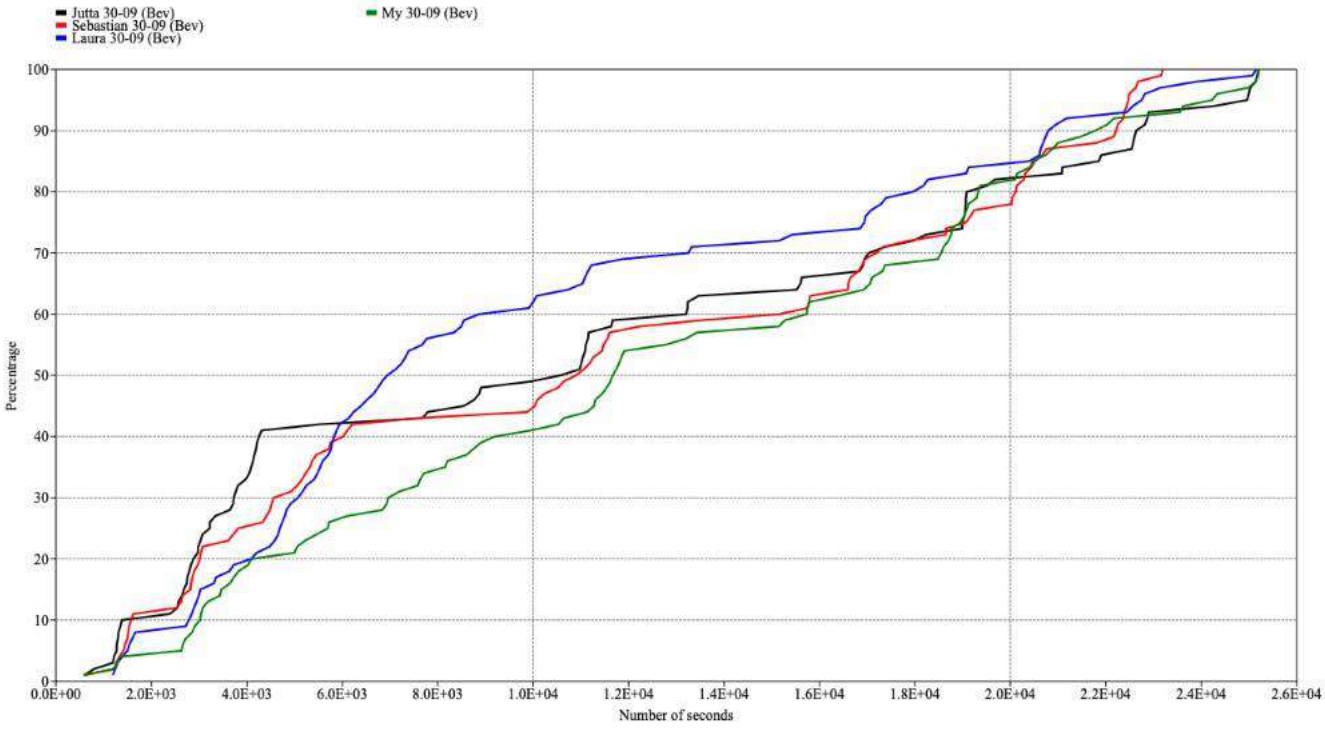
Appendix C

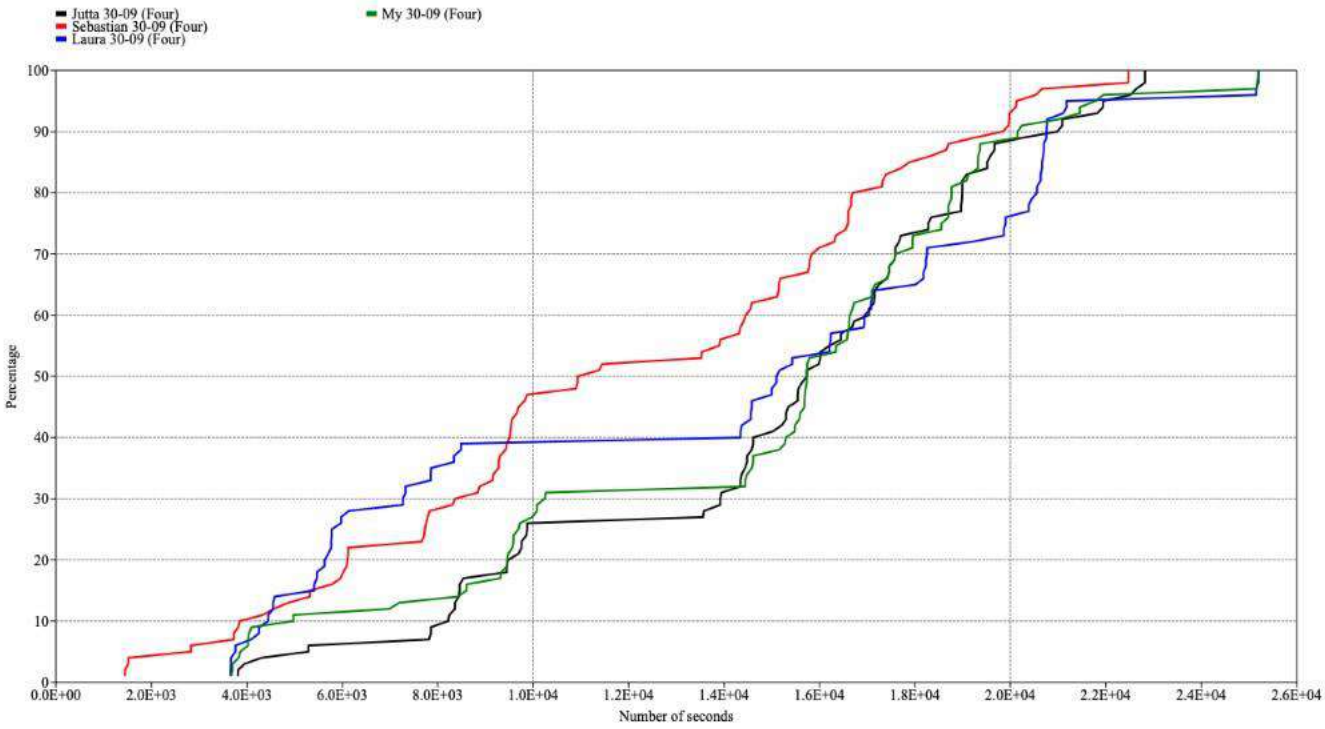
Cumulative curves

Not enough data for the following: Reaction to guests/zookeepers (30.09, 02.10, 16.10, 18.10) and Stereotype behaviour (30.09, 02.10, 16.10, 18.10).

30.9






Jutta 30-09 (Four)
Sebastian 30-09 (Four)
Laura 30-09 (Four)
My 30-09 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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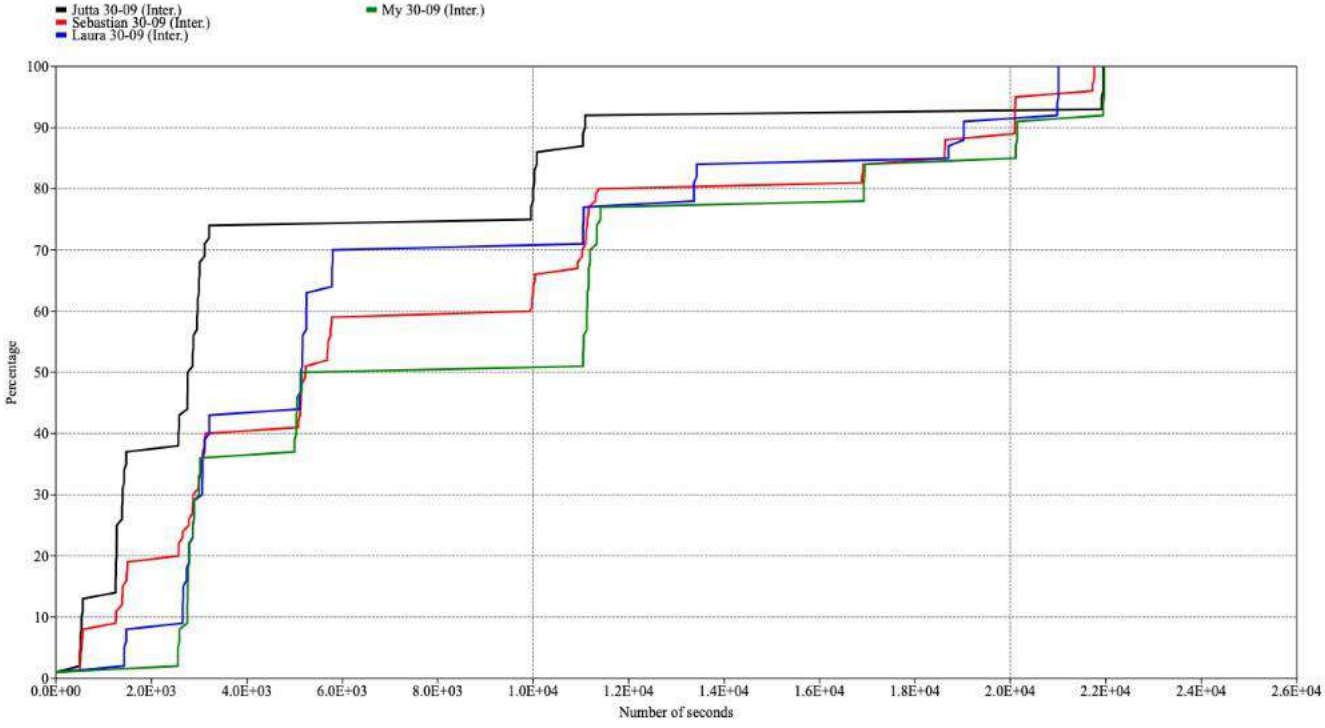
2.2E+04
2.4E+04
2.6E+04


Jutta 30-09 (Inter.)
Sebastian 30-09 (Inter.)
Laura 30-09 (Inter.)
My 30-09 (Inter.)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
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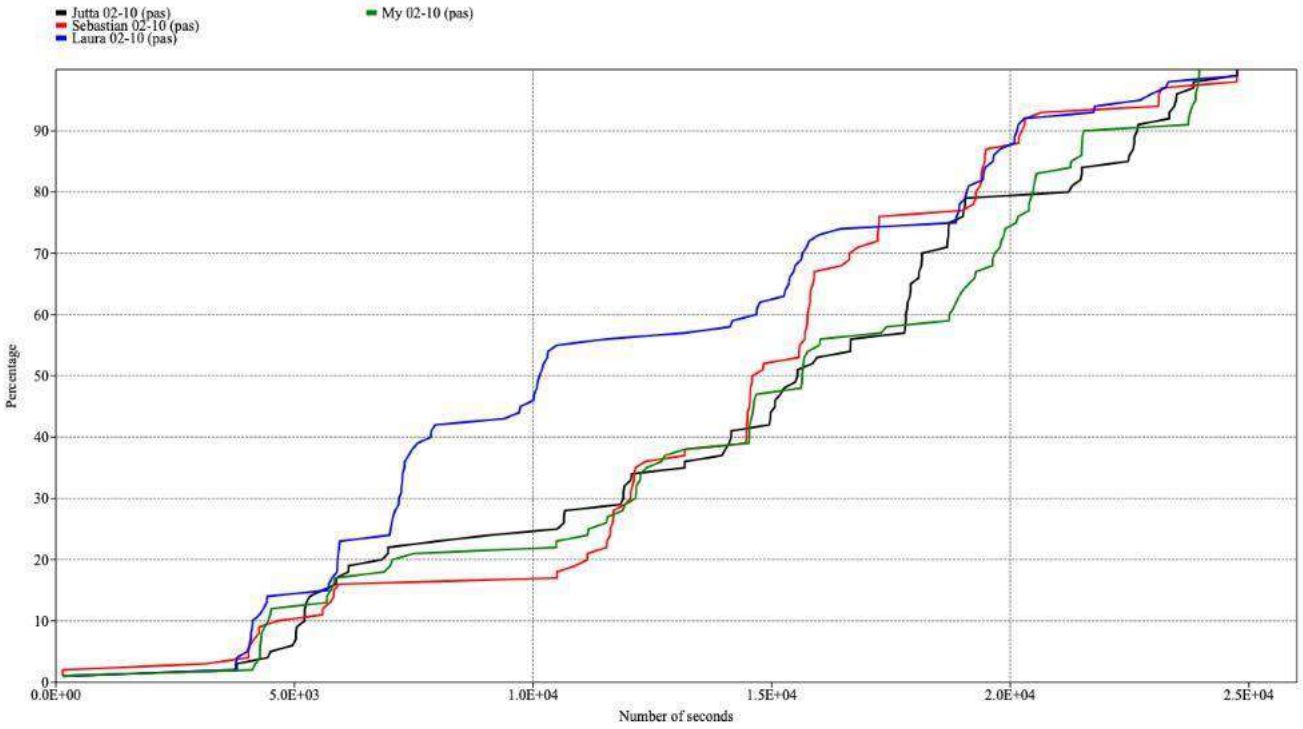
2.2E+04
2.4E+04
2.6E+04

02.10


Jutta 02-10 (pas)
Sebastian 02-10 (pas)
Laura 02-10 (pas)
My 02-10 (pas)
Percentage
Number of seconds
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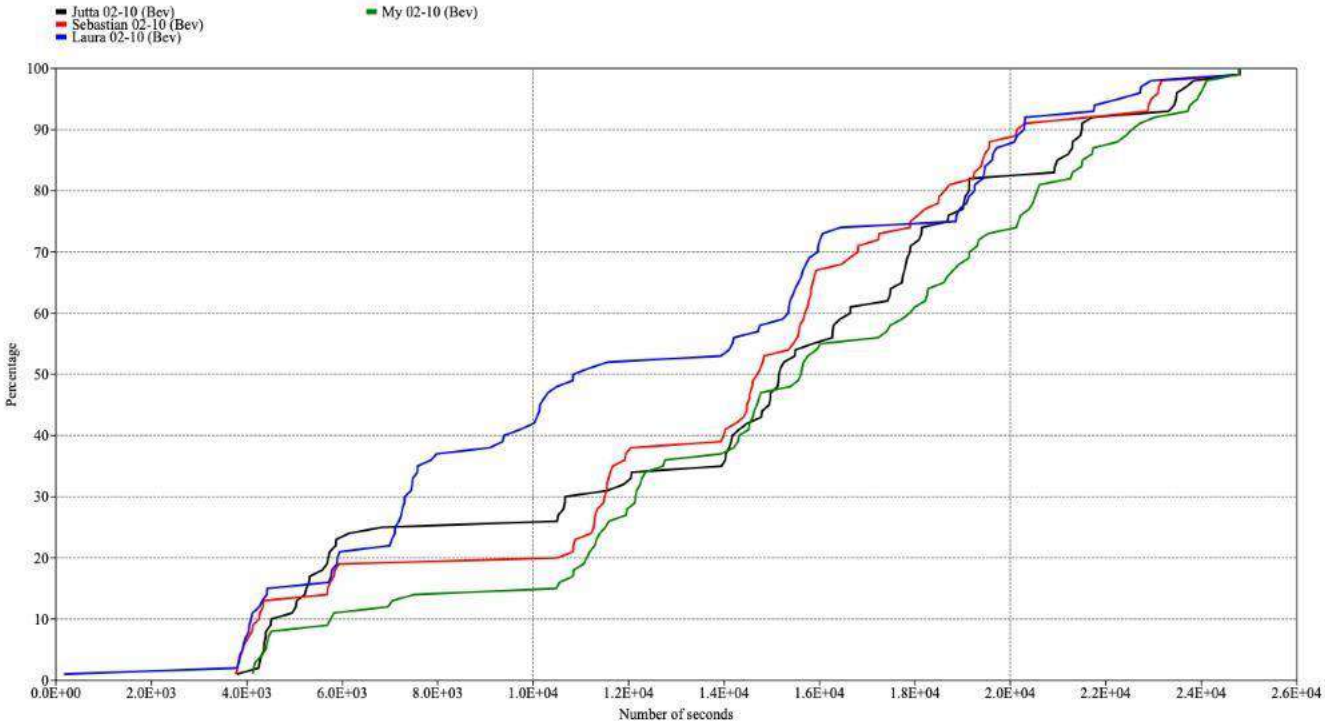
1.0E+04
1.5E+04
2.0E+04
2.5E+04


Jutta 02-10 (Bev)
Sebastian 02-10 (Bev)
Laura 02-10 (Bev)
My 02-10 (Bev)
Percentage
Number of seconds
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2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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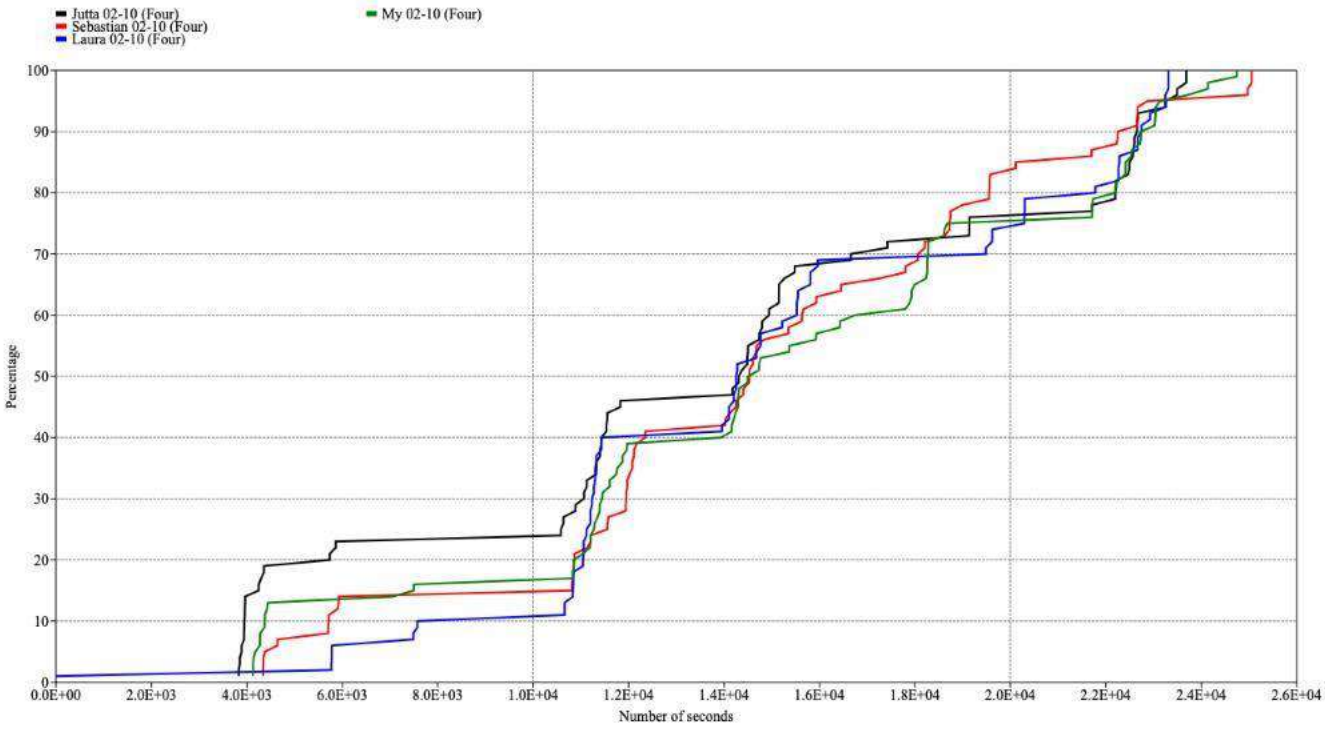
2.2E+04
2.4E+04
2.6E+04


Jutta 02-10 (Four)
Sebastian 02-10 (Four)
Laura 02-10 (Four)
My 02-10 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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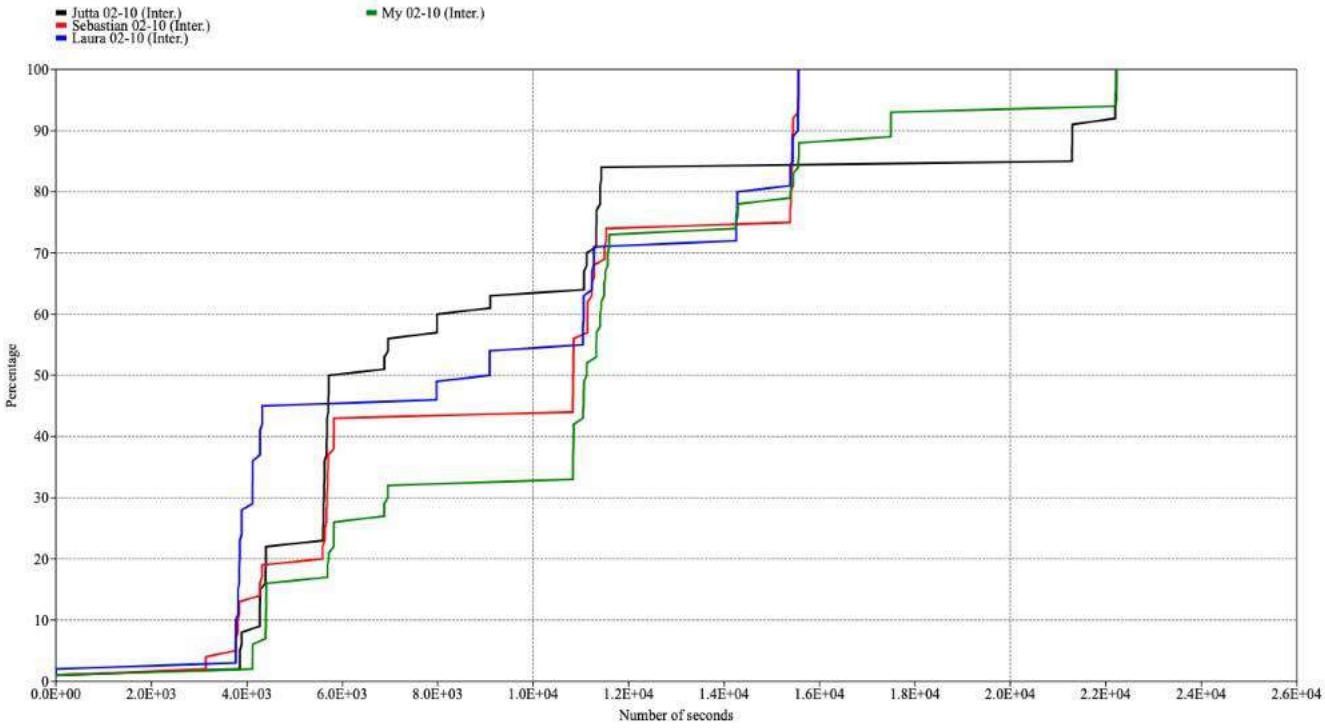
2.2E+04
2.4E+04
2.6E+04


Jutta 02-10 (Inter.)
Sebastian 02-10 (Inter.)
Laura 02-10 (Inter.)
My 02-10 (Inter.)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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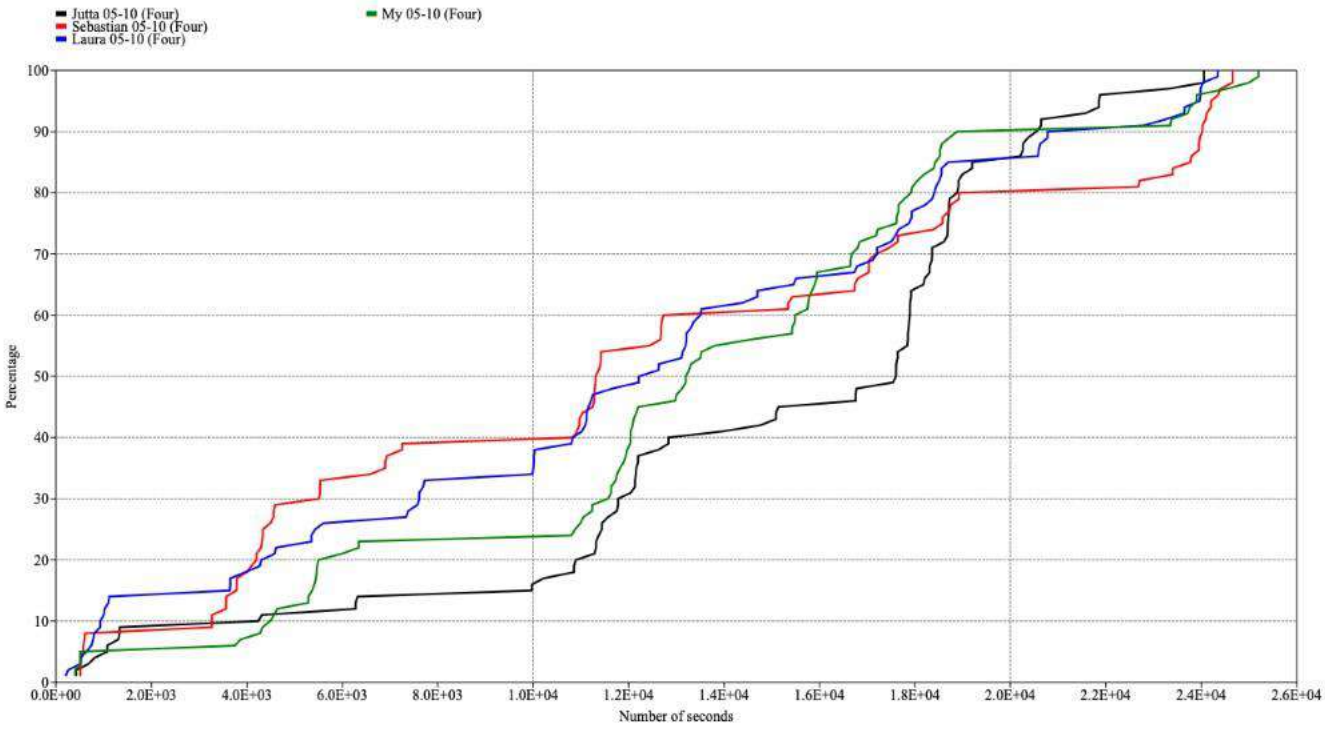
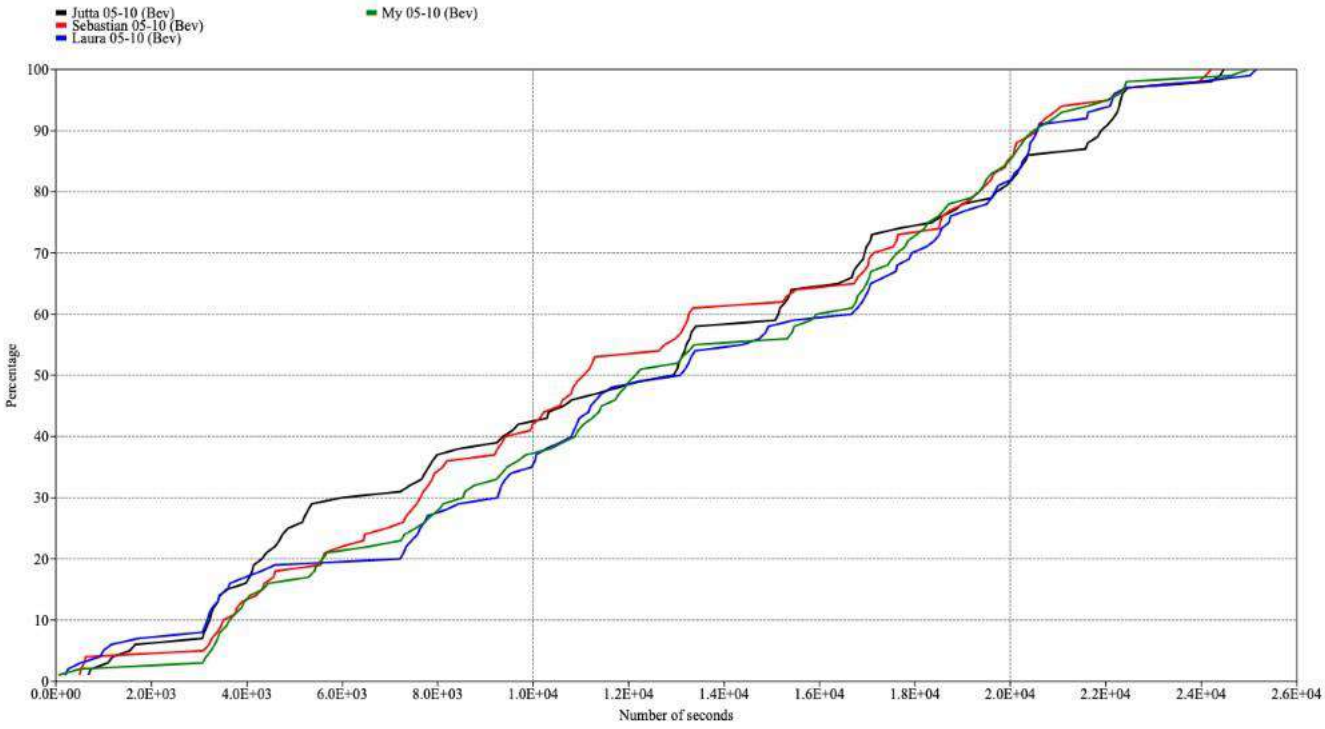
2.2E+04
2.4E+04
2.6E+04


Jutta 05-10 (Four)
Sebastian 05-10 (Four)
Laura 05-10 (Four)
My 05-10 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

05.10


Jutta 05-10 (Bev)
Sebastian 05-10 (Bev)
Laura 05-10 (Bev)
My 05-10 (Bev)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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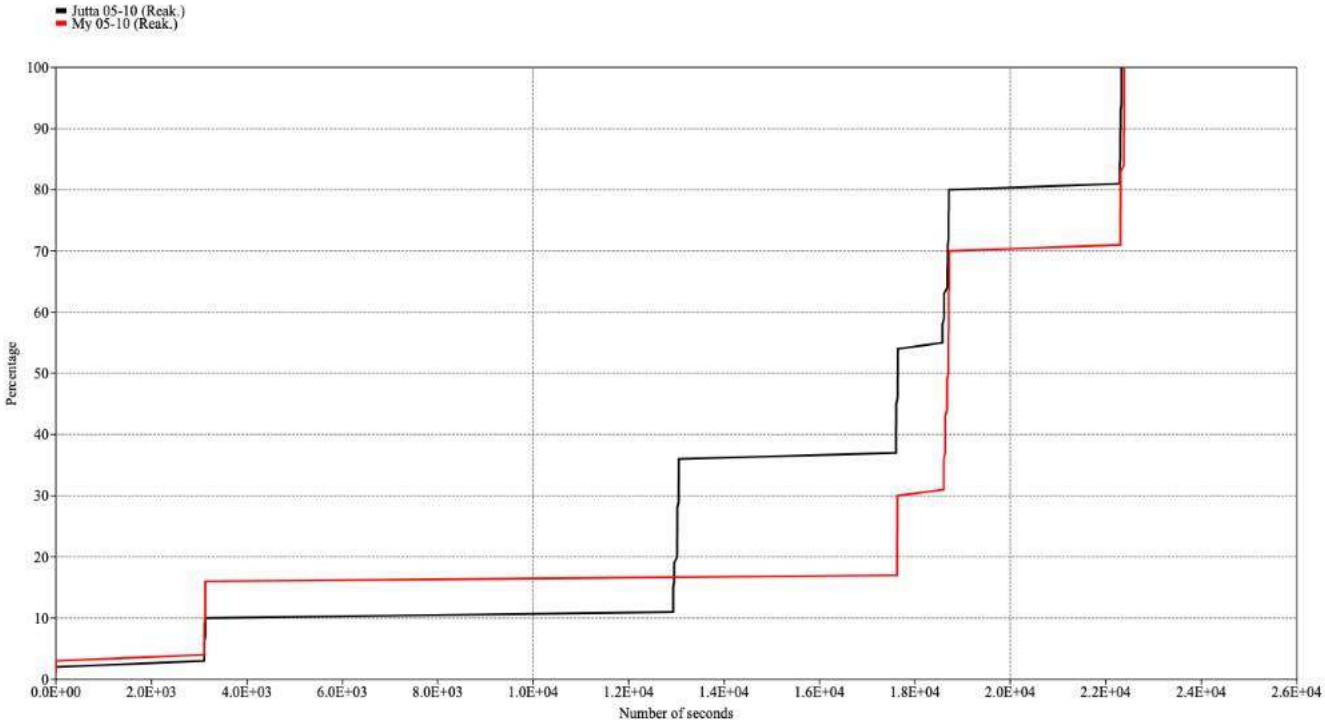
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 05-10 (Reak.)
My 05-10 (Reak.)
Percentage
Number of seconds
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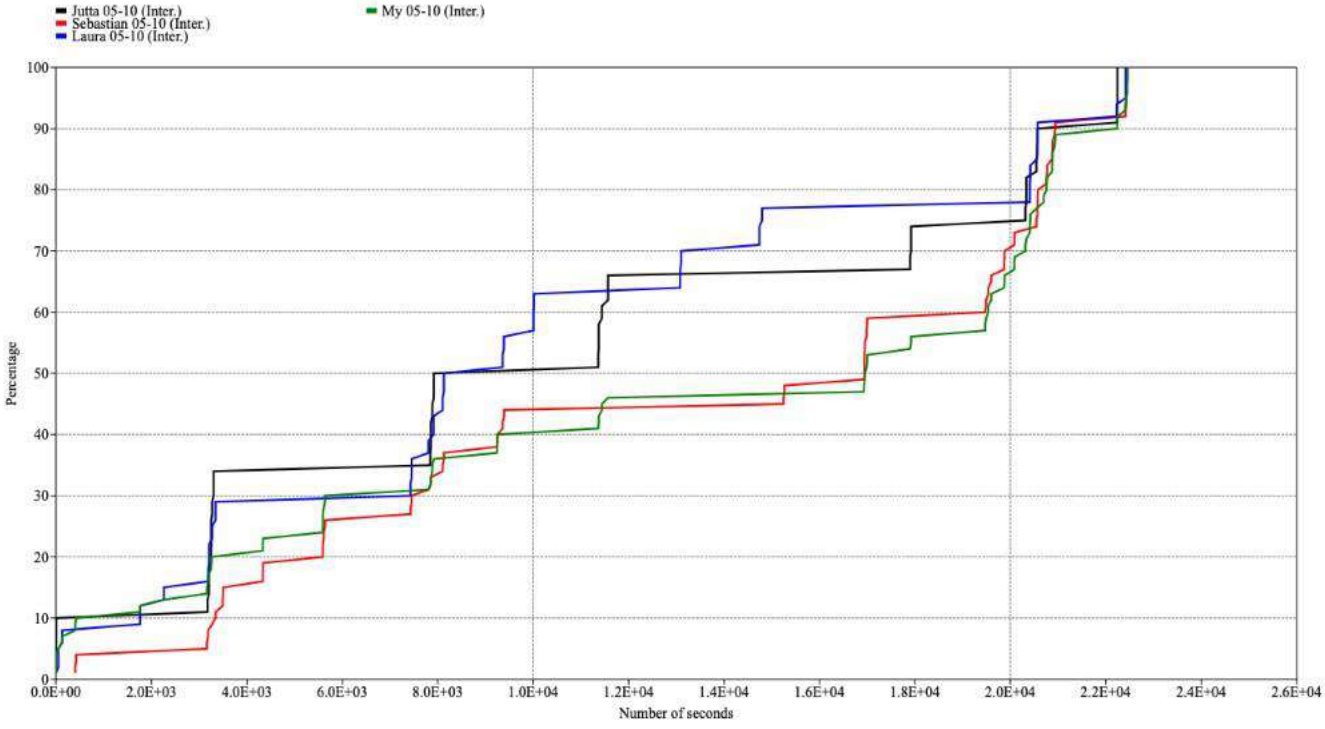
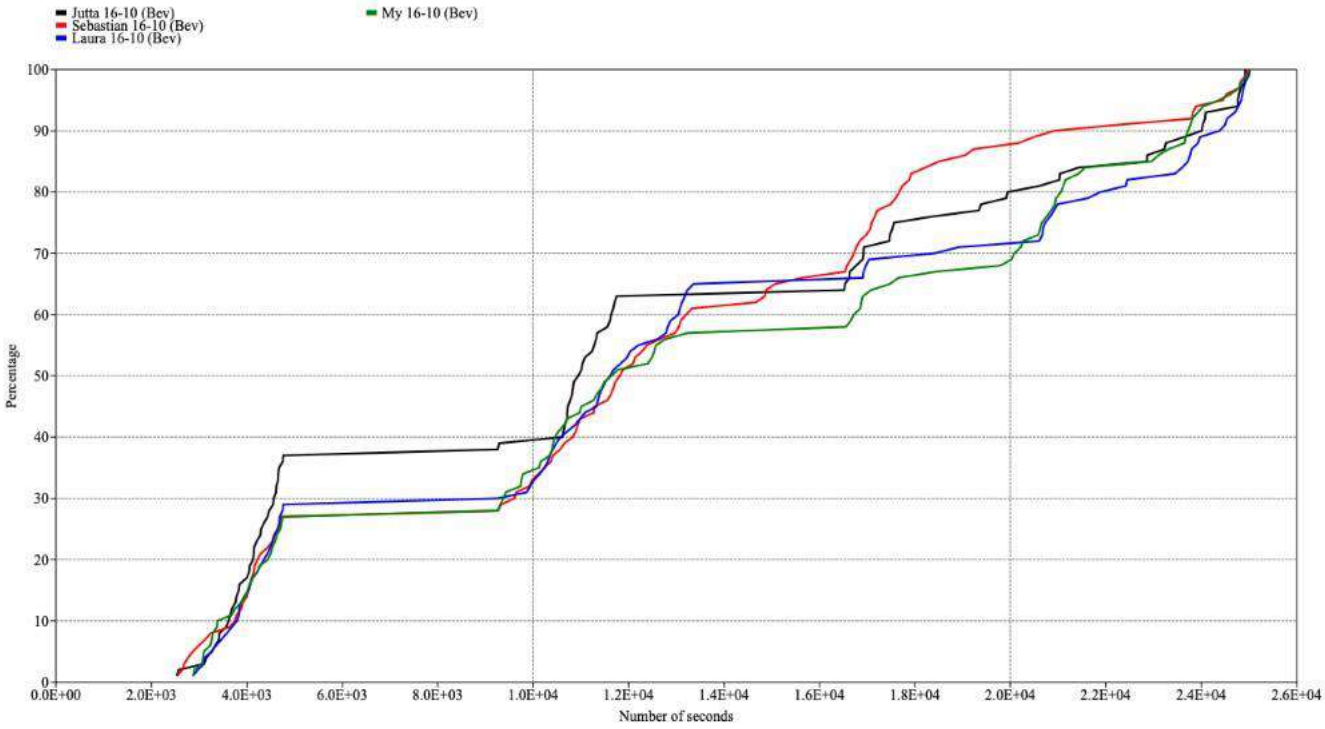
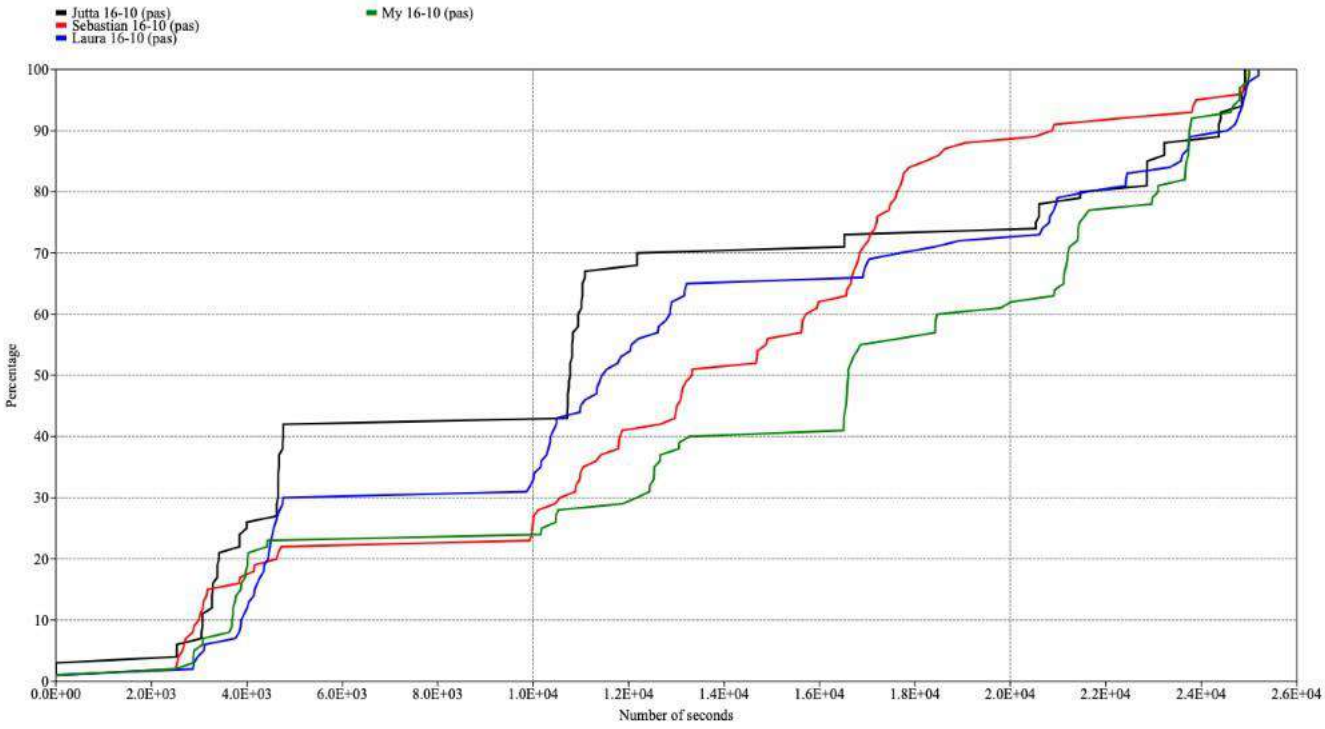
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 05-10 (Inter.)
Sebastian 05-10 (Inter.)
Laura 05-10 (Inter.)
My 05-10 (Inter.)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

16.10


Jutta 16-10 (Bev)
Sebastian 16-10 (Bev)
Laura 16-10 (Bev)
My 16-10 (Bev)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 16-10 (pas)
Sebastian 16-10 (pas)
Laura 16-10 (pas)
My 16-10 (pas)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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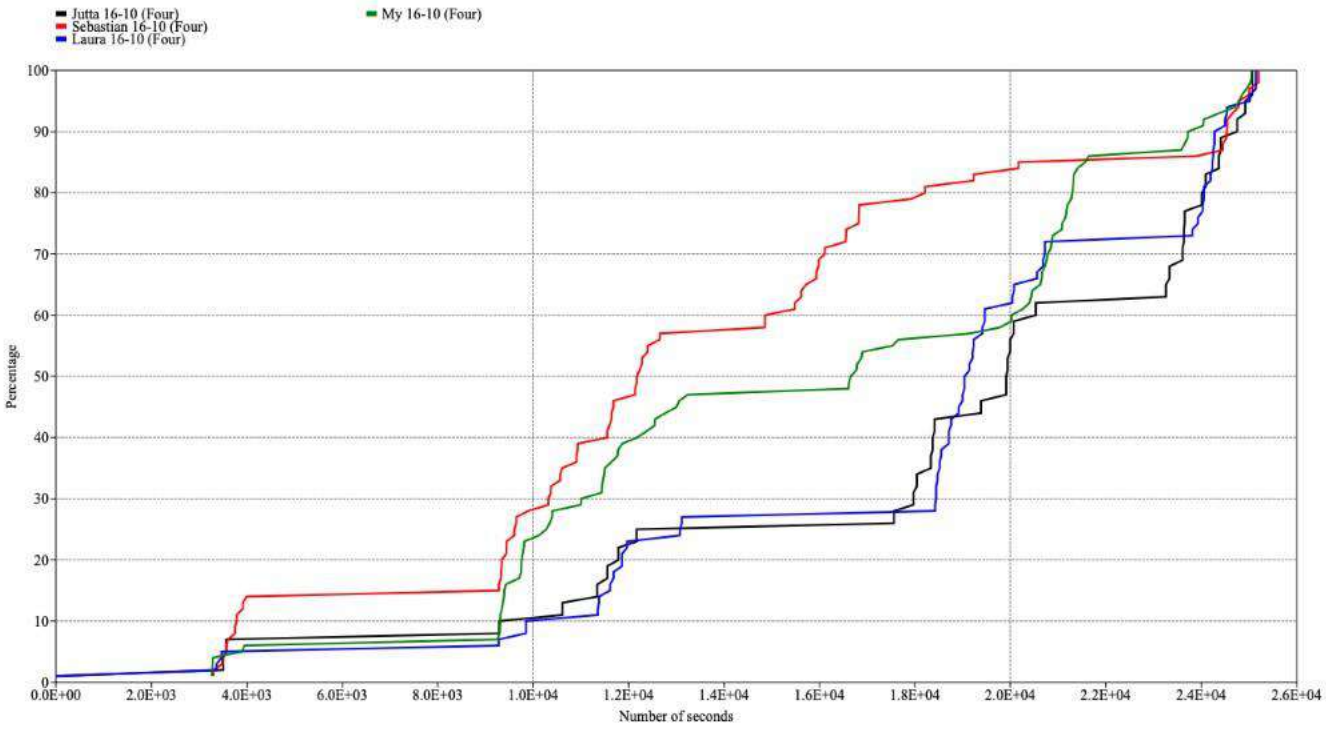
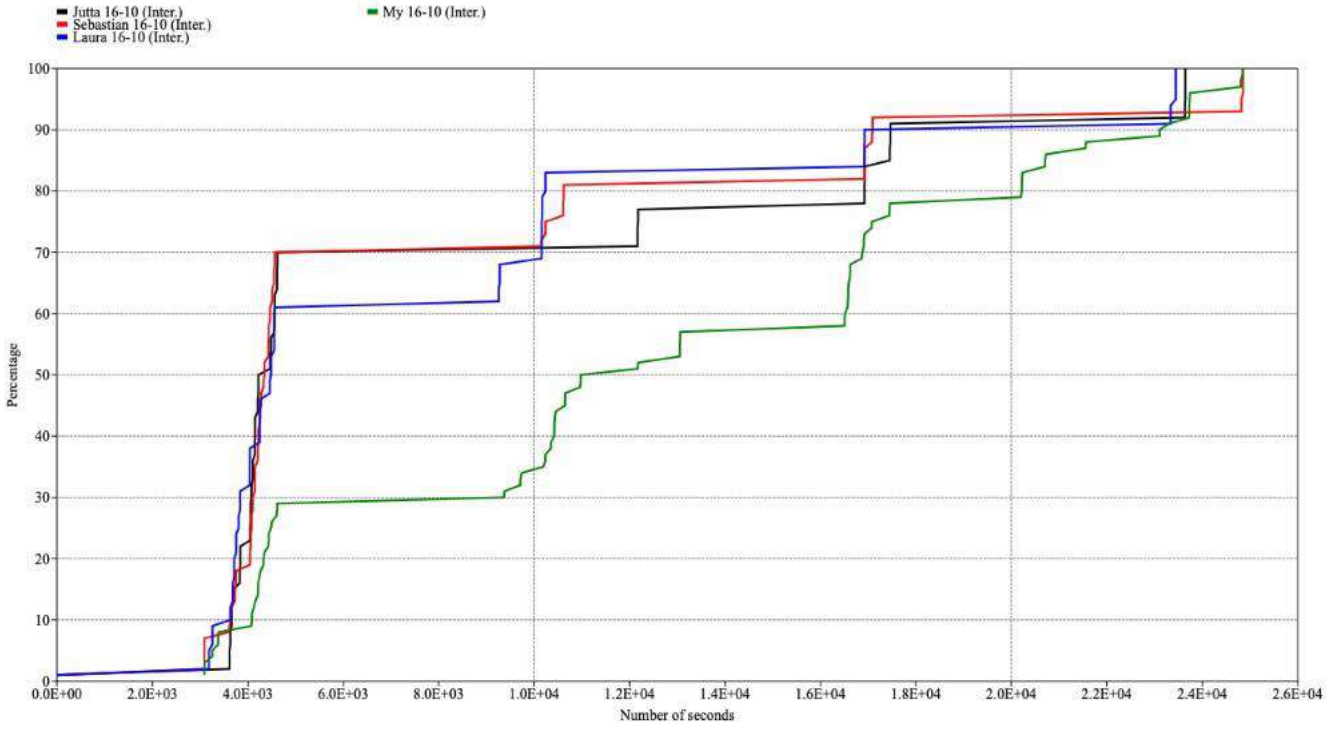
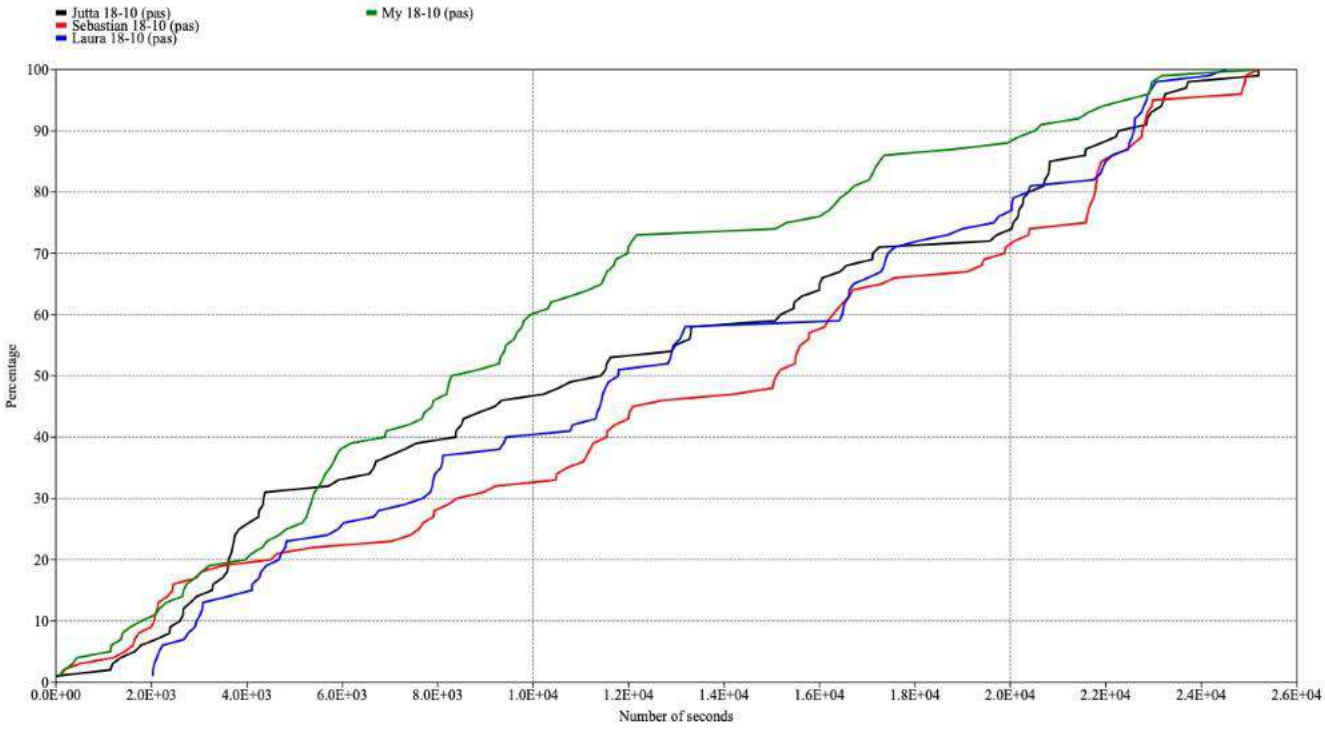
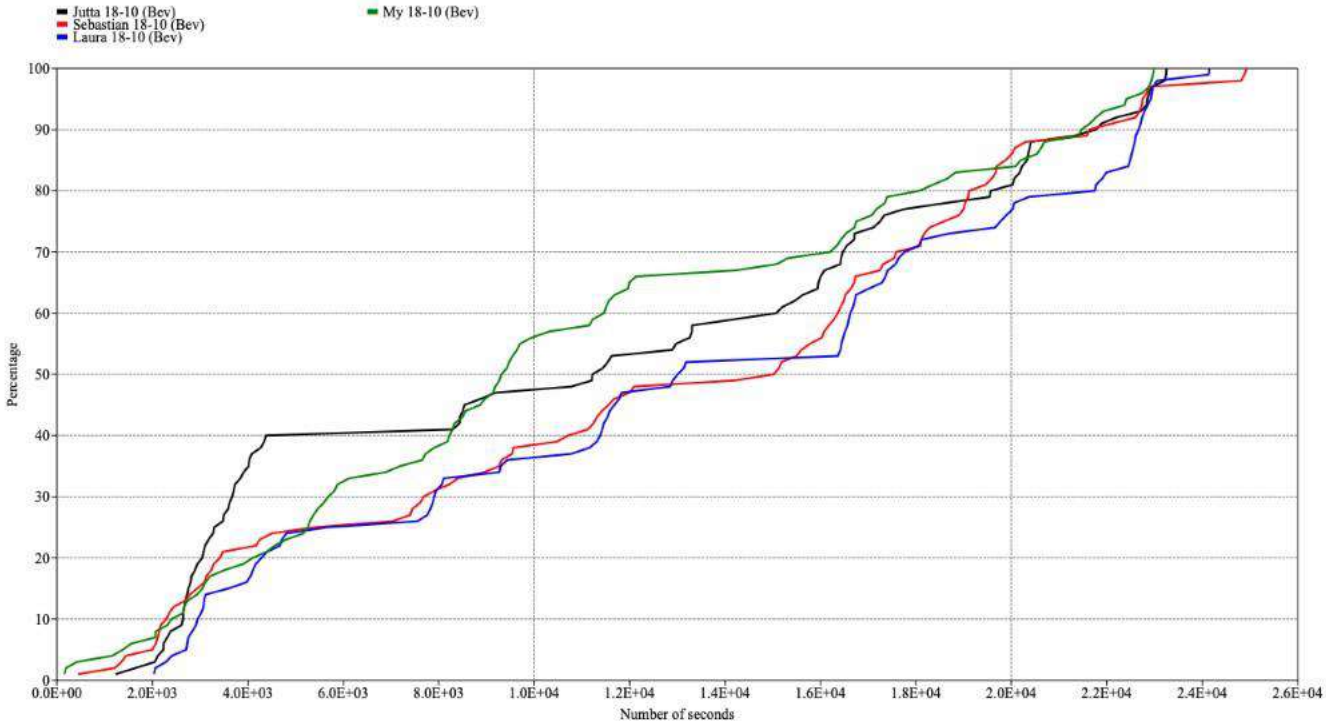
2.2E+04
2.4E+04
2.6E+04

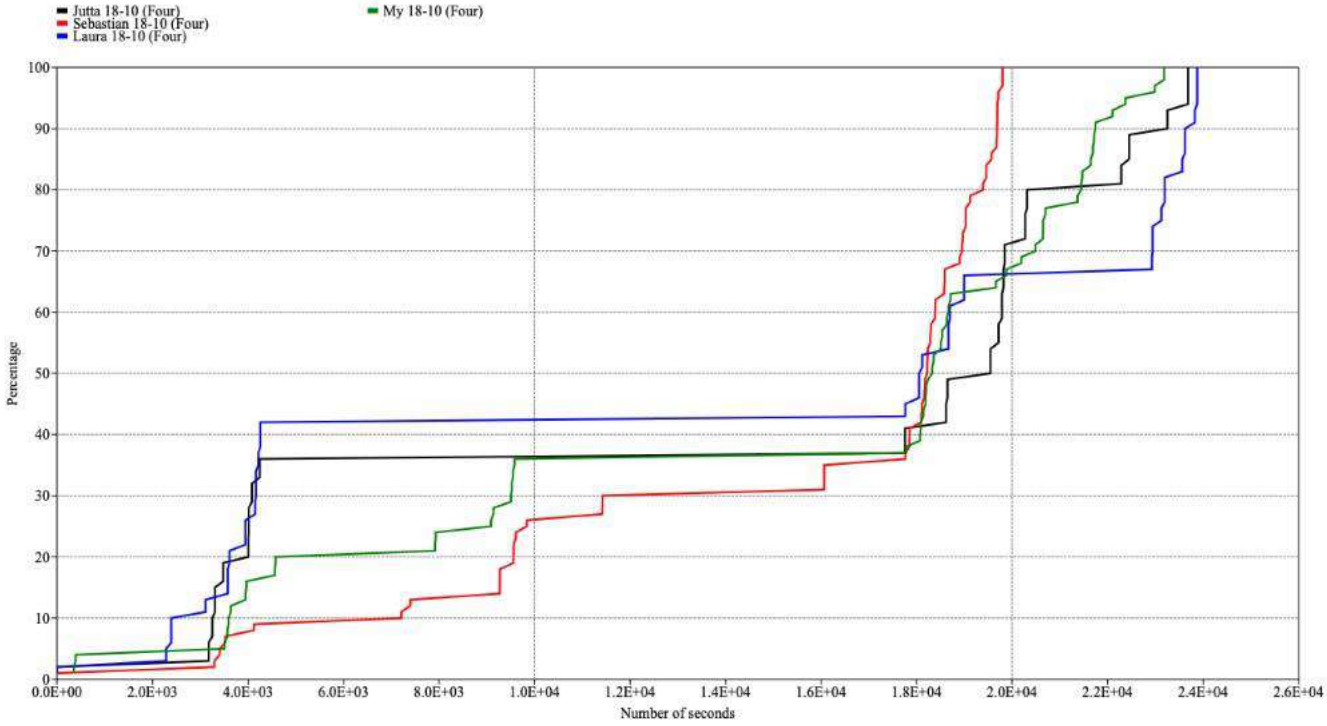

Jutta 16-10 (Four)
Sebastian 16-10 (Four)
Laura 16-10 (Four)
My 16-10 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

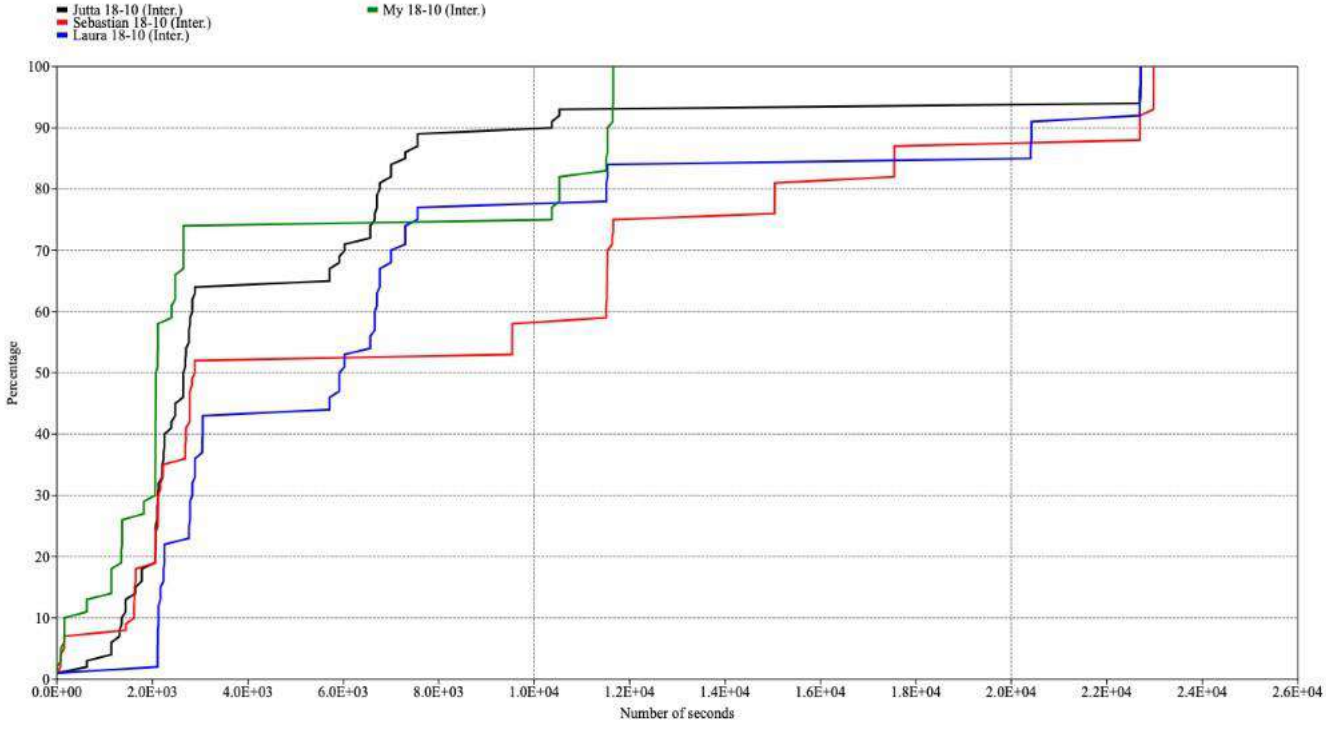

Jutta 16-10 (Inter.)
Sebastian 16-10 (Inter.)
Laura 16-10 (Inter.)
My 16-10 (Inter.)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

18.10

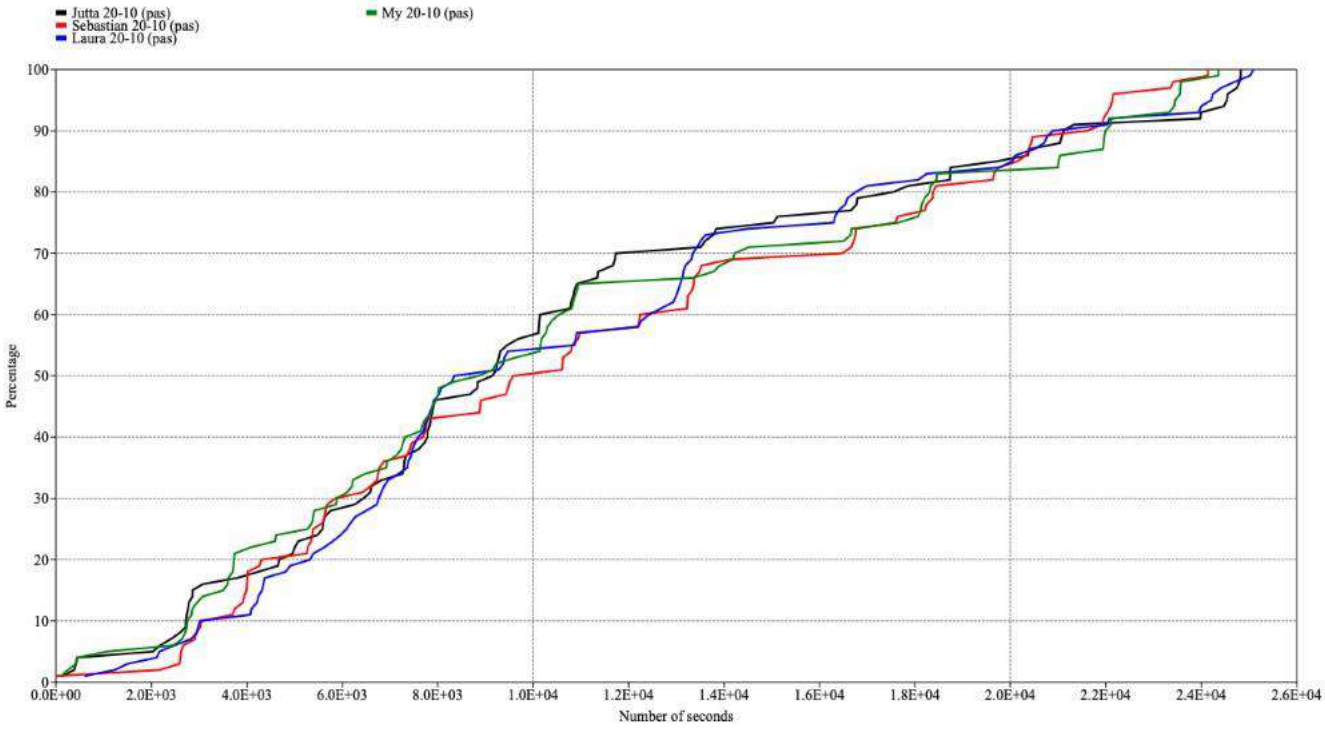

Jutta 18-10 (pas)
Sebastian 18-10 (pas)
Laura 18-10 (pas)
My 18-10 (pas)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 18-10 (Bev)
Sebastian 18-10 (Bev)
Laura 18-10 (Bev)
My 18-10 (Bev)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 18-10 (Four)
Sebastian 18-10 (Four)
Laura 18-10 (Four)
My 18-10 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 18-10 (Inter.)
Sebastian 18-10 (Inter.)
Laura 18-10 (Inter.)
My 18-10 (Inter.)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

20.10


Jutta 20-10 (pas)
Sebastian 20-10 (pas)
Laura 20-10 (pas)
My 20-10 (pas)
Percentage
Number of seconds
0
10
20
30
40
50
60
70
80
90
100
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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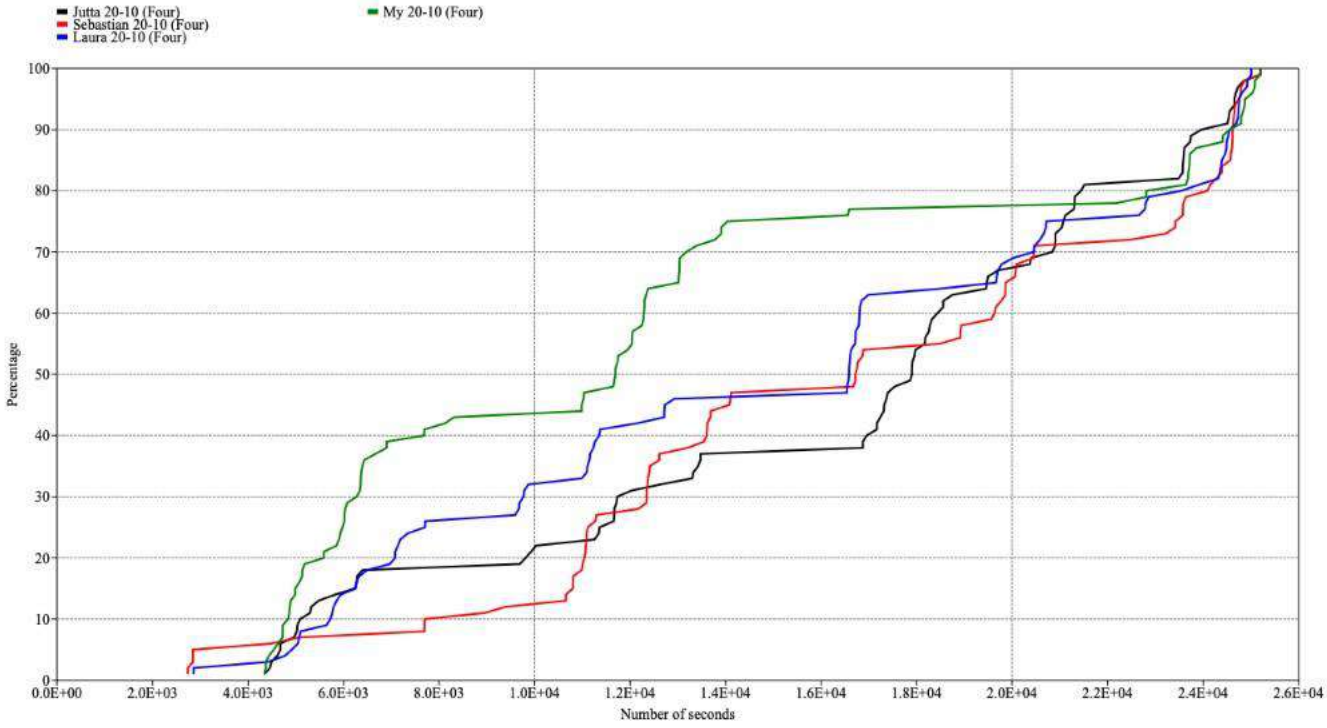
2.2E+04
2.4E+04
2.6E+04


Jutta 20-10 (Four)
Sebastian 20-10 (Four)
Laura 20-10 (Four)
My 20-10 (Four)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
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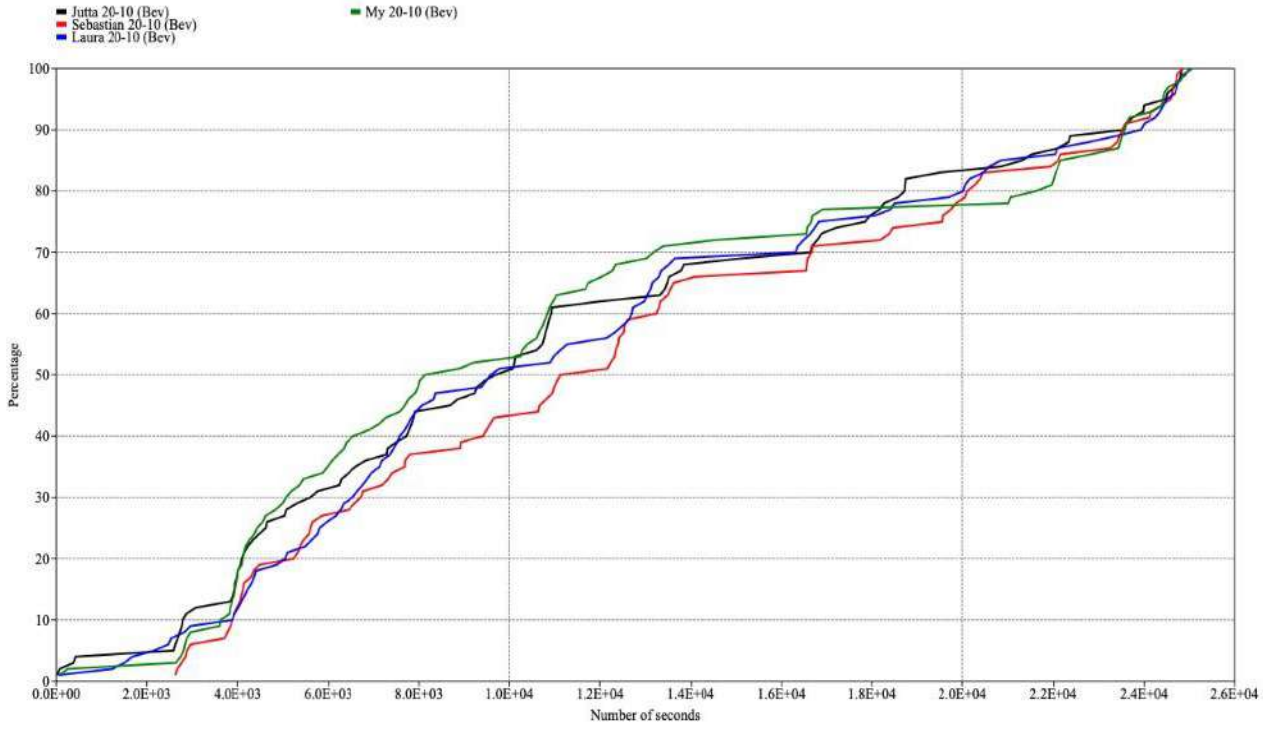
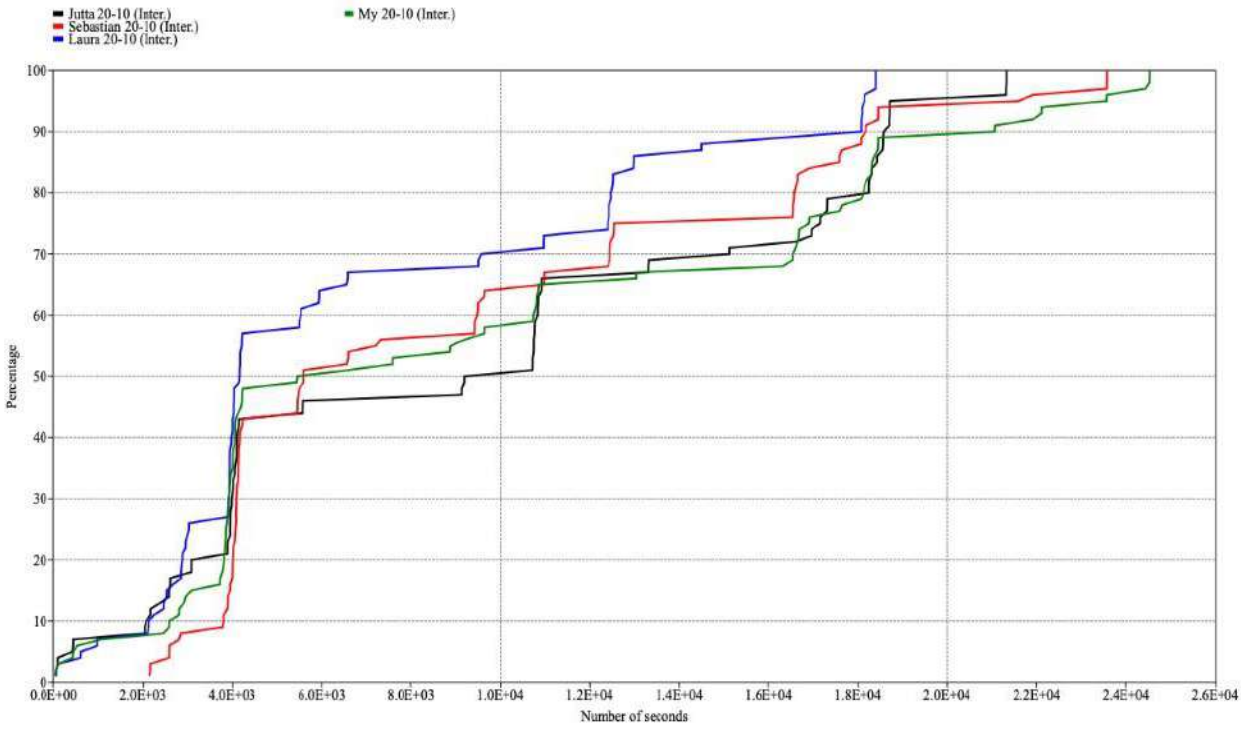
2.2E+04
2.4E+04
2.6E+04


Jutta 20-10 (Bev)
Sebastian 20-10 (Bev)
Laura 20-10 (Bev)
My 20-10 (Bev)
Percentage
Number of seconds
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04


Jutta 20-10 (Inter.)
Sebastian 20-10 (Inter.)
Laura 20-10 (Inter.)
My 20-10 (Inter.)
Percentage
Number of seconds
0
10
20
30
40
50
60
70
80
90
100
0.0E+00
2.0E+03
4.0E+03
6.0E+03
8.0E+03
1.0E+04
1.2E+04
1.4E+04
1.6E+04
1.8E+04
2.0E+04
2.2E+04
2.4E+04
2.6E+04

Appendix D
Time consumption

		Sebastian		Laura		My	
Control		Chi2	P	Chi2	P	Chi2	P
Passive behaviour	Jutta	0.38	0.83	2.15	0.34	0.37	0.83
	Sebastian			4.41	0.11	1.51	0.47
	Laura					1.04	0.60
	My						
Movement	Jutta	0.41	0.98	1.20	0.55	0.87	0.65
	Sebastian			0.91	0.64	0.59	0.74
	Laura					0.17	0.92
	My						
Foraging	Jutta	0.65	0.72	1.25	0.54	1.43	0.49
	Sebastian			0.58	0.75	0.49	0.78
	Laura					1.90	0.39
	My						
Reaction to guests/zoo keepers	Jutta	0	1	0	1	0	1
	Sebastian			-	-	-	-
	Laura					-	-
	My						
Stereotype behaviour	Jutta	0	1	1.64	0.44	0.83	0.66
	Sebastian			0	1	0	1
	Laura					3.43	0.18
	My						
Interaction	Jutta	8.58	0.014*	18.13	0.00012 **	3.303	6.72*10 ^-8**
	Sebastian			0.92	0.63	5.92	0.052
	Laura					3.29	0.19
	My						
Holiday							
Passive behaviour	Jutta	0.65	0.72	0.42	0.81	1.20	0.55
	Sebastian			1.98	0.37	3.66	0.16
	Laura					0.62	0.73
	My						
Movement	Jutta	0.24	0.89	0.12	0.94	0.57	0.75
	Sebastian			0.62	0.74	0.48	0.79
	Laura					1.45	0.48
	My						
Foraging	Jutta	0.052	0.97	0.28	0.87	0.33	0.85
	Sebastian			0.11	0.95	0.26	0.88
	Laura					0.18	0.92
	My						
Reaction to guests/zoo keepers	Jutta	-	-	-	-	0	1
	Sebastian			-	-	0	1
	Laura					0	1
	My						
Stereotype behaviour	Jutta	0.92	0.63	0.86	0.65	0	1
	Sebastian			1.2	0.27	0	1
	Laura					0	1
	My						
Interaction	Jutta	6.82	0.033*	3.58	0.17	8.39	0.015*
	Sebastian			1.29	0.53	0.23	0.89
	Laura					0.91	0.63
	My						

*P<0.05

**P<0.01

¥ Pga. nulrække var denne sammenligning ikke mulig

Appendix E

Kruskal Wallis and Mann-Whitney pairwise tests

Comparisons Between The Periods

Jutta

Passive behaviour
Kruskal-Wallis test for equal medians
H (chi2): 9.471
Hc (tie corrected): 9.473
p (same): 0.09162
There is no significant difference between sample medians

Movement
Kruskal-Wallis test for equal medians

H (chi2): 11.93

Hc (tie corrected): 11.94

p (same): 0.0356

There is a significant difference between sample medians

Foraging
Kruskal-Wallis test for equal medians

H (chi2): 12.22

Hc (tie corrected): 12.22

p (same): 0.03185

There is a significant difference between sample medians

Interaction
Kruskal-Wallis test for equal medians H (chi2): Hc (tie corrected):
p (same):
There is a significant difference between sample medians

Sebastian

Passive behaviour
Kruskal-Wallis test for equal medians

H (chi2): 5.89

Hc (tie corrected): 5.891

p (same): 0.3169

There is no significant difference between sample medians

Movement
Kruskal-Wallis test for equal medians
H (chi2): 9.727

Hc (tie corrected): 9.737

p (same): 0.08303

There is no significant difference between sample medians

Foraging
Kruskal-Wallis test for equal medians

H (chi2):	7.769
Hc (tie corrected):	7.771
p (same):	0.1693

There is no significant difference between sample medians

Interaction
Kruskal-Wallis test for equal medians

H (chi2):	5.956
Hc (tie corrected):	5.963
p (same):	0.3099

There is no significant difference between sample medians

Laura

Passive behaviour
Kruskal-Wallis test for equal medians

H (chi2):	17.02
Hc (tie corrected):	17.02
p (same):	0.004454

There is a significant difference between sample medians

Movement
Kruskal-Wallis test for equal medians

H (chi2):	2.408
Hc (tie corrected):	2.411
p (same):	0.7899

There is no significant difference between sample medians

Foraging
Kruskal-Wallis test for equal medians

H (chi2):	7.183
Hc (tie corrected):	7.184
p (same):	0.2073

There is no significant difference between sample medians

Stereotype behaviour
Kruskal-Wallis test for equal medians

H (chi2):	0.1026
Hc (tie corrected):	0.1026
p (same):	0.7488

There is no significant difference between sample medians

Interaction
Kruskal-Wallis test for equal medians

H (chi2): 2.954

Hc (tie corrected): 2.957

p (same): 0.7067

There is no significant difference between sample medians

My

Passive behaviour

Kruskal-Wallis test for equal medians

H (chi2): 18.92

Hc (tie corrected): 18.93

p (same): 0.001981

There is a significant difference between sample medians

Movement

Kruskal-Wallis test for equal medians

H (chi2): 18.1

Hc (tie corrected): 18.12

p (same): 0.0028

There is a significant difference between sample medians

Foraging

Kruskal-Wallis test for equal medians

H (chi2): 10.28

Hc (tie corrected): 10.28

p (same): 0.06766

There is no significant difference between sample medians
Reaction to guests/zookeepers
Kruskal-Wallis test for equal medians

H (chi2): 8.095

Hc (tie corrected): 8.112

p (same): 0.01732

There is a significant difference between sample medians Interaction

Kruskal-Wallis test for equal medians

H (chi2):	12.7
Hc (tie corrected):	12.73
p (same):	0.02609

There is a significant difference between sample medians

Mann-Whitnet Pairwise

			C1	C2	C3	H1	H2	H3
Passive behaviour	Jutta	C1		C2>C1*	n.s.	n.s.	n.s.	n.s.
		C2	C2>C1*		C2>C3*	n.s.	n.s.	C2>H3*
		C3	n.s.	C2>C3*		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	C2>H3*	n.s.	n.s.	n.s.	
	Sebastian	C1		n.s.	C1>C3*	n.s.	n.s.	n.s.
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	C1>C3*	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	n.s.	n.s.	n.s.	n.s.	
	Laura	C1		C2>C1**	n.s.	n.s.	H2>C1*	n.s.
		C2	C2>C1**		C2>C3*	n.s.	n.s.	C2>H3**
		C3	n.s.	C2>C3*		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	H1>H3*
		H2	H2>C1*	n.s.	n.s.	n.s.		H2>H3**
		H3	n.s.	C2>H3**	n.s.	H1>H3*	H2>H3**	
	My	C1		n.s.	C1>C3*	C1>H1**	n.s.	C1>H3*
		C2	n.s.		n.s.	C2>H1*	n.s.	n.s.
		C3	C1>C3*	n.s.		n.s.	H2>C3*	n.s.
		H1	C1>H1**	C2>H1*	n.s.		H2>H1**	n.s.
		H2	n.s.	n.s.	H2>C3*	H2>H1**		H2>H3*
		H3	C1>H3*	n.s.	n.s.	n.s.	H2>H3*	
Movement	Jutta	C1		n.s.	n.s.	H1>C1**	n.s.	n.s.
		C2	n.s.		n.s.	H1>C2**	n.s.	n.s.
		C3	n.s.	n.s.		H1>C3**	n.s.	n.s.
		H1	H1>C1**	H1>C2**	H1>C3**		H1>H2*	H1>H3*
		H2	n.s.	n.s.	n.s.	H1>H2*		n.s.
		H3	n.s.	n.s.	n.s.	H1>H3*	n.s.	
	Sebastian	C1		n.s.	n.s.	n.s.	C1>H2**	n.s.
		C2	n.s.		n.s.	n.s.	C2>H2*	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	C1>H2**	C2>H2*	n.s.	n.s.		H3>H2*
		H3	n.s.	n.s.	n.s.	n.s.	H3>H2*	
	Laura	C1		n.s.	n.s.	n.s.	n.s.	n.s.
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.

		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	n.s.	n.s.	n.s.	n.s.	
	My	C1		C1>C2*	C1>C3**	C1>H1**	C1>H2*	C1>H3**
		C2	C1>C2*		n.s.	n.s.	n.s.	n.s.
		C3	C1>C3**	n.s.		n.s.	n.s.	n.s.
		H1	C1>H1**	n.s.	n.s.		H2>H1*	n.s.
		H2	C1>H2*	n.s.	n.s.	H2>H1*		n.s.
		H3	C1>H3**	n.s.	n.s.	n.s.	n.s.	
Foraging	Jutta	C1		n.s.	n.s.	H1>C1**	n.s.	n.s.

		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		H1>C3**	n.s.	n.s.
		H1	H1>C1**	n.s.	H1>C3**		n.s.	H1>H3*
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	n.s.	n.s.	H1>H3*	n.s.	
	Sebastian	C1		C2>C1*	n.s.	H1>C1*	n.s.	n.s.
		C2	C2>C1*		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	H1>C1*	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	n.s.	n.s.	n.s.	n.s.	
	Laura	C1		n.s.	n.s.	n.s.	n.s.	n.s.
		C2	n.s.		n.s.	n.s.	n.s.	C2>H3*
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	C2>H3*	n.s.	n.s.	n.s.	
	My	C1		n.s.	n.s.	n.s.	n.s.	H3>C1*
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		H2>H1*	H3>H1**
		H2	n.s.	n.s.	n.s.	H2>H1*		n.s.
		H3	H3>C1*	n.s.	n.s.	H3>H1**	n.s.	
Reaction to guests/zook eepers	Jutta	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
	Sebastian	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
	Laura	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	

	My	C1		-	-	-	-	-
		C2	-		n.s.	C2>H1**	-	-
		C3	-	n.s.		n.s.	-	-
		H1	-	C2>H1**	n.s.		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
Stereotype	Jutta	C1		-	-	-	-	-
behaviour		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
	Sebastian	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
	Laura	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	n.s.
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	n.s.	-	-	
	My	C1		-	-	-	-	-
		C2	-		-	-	-	-
		C3	-	-		-	-	-
		H1	-	-	-		-	-
		H2	-	-	-	-		-
		H3	-	-	-	-	-	
Interaction	Jutta	C1		n.s.	n.s.	n.s.	H2>C1*	n.s.
		C2	n.s.		n.s.	n.s.	H2>C2*	n.s.
		C3	n.s.	n.s.		n.s.	H2>C3*	n.s.
		H1	n.s.	n.s.	n.s.		H2>H1**	n.s.
		H2	H2>C1*	H2>C2*	H2>C3*	H2>H1**		H2>H3**
		H3	n.s.	n.s.	n.s.	n.s.	H2>H3**	
	Sebastian	C1		n.s.	n.s.	n.s.	n.s.	C1>H3*
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	C1>H3*	n.s.	n.s.	n.s.	n.s.	
	Laura	C1		n.s.	n.s.	n.s.	n.s.	n.s.
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	n.s.	n.s.		n.s.	n.s.	n.s.
		H1	n.s.	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	n.s.	n.s.	n.s.	n.s.	n.s.	
	My	C1		n.s.	C1>C3*	C1>H1**	n.s.	C1>H3**
		C2	n.s.		n.s.	n.s.	n.s.	n.s.
		C3	C1>C3*	n.s.		n.s.	n.s.	n.s.
		H1	C1>H1**	n.s.	n.s.		n.s.	n.s.
		H2	n.s.	n.s.	n.s.	n.s.		n.s.
		H3	C1>H3**	n.s.	n.s.	n.s.	n.s.	
*P<0.05								
**P<0.01								

Appendix F

Summary Statistics For Comparisons Between The Periods

Jutta

Passive

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	53	53	53	39	39	39	69		69		69
Min	3			10			10				
Max	2141			3651			1338				
Sum	8651	2637	13267	11787	2882	18238	7926		4168		10916
Mean	163.23	49.75	250.32	302.23	73.90	467.64	114.87		60.41		158.20
Std. error	51.93	0.00	71.45	103.87	0.00	142.07	25.54		0.00		33.66
Variance	142907.50	-31806.39	270542.20	420743.40	-149158.60	787158.00	45017.70		-4075.06		78191.96
Stand. dev	378.03	192.48	632.48	648.65	301.98	1064.21	212.17		117.57		315.52
Median	28.00	6.00	32.00	66.00	27.00	88.00	31.00		12.00		34.00
25 prcntil	18.50	13.00	22.00	27.00	5.00	34.00	17.00		9.00		19.50
75 prcntil	104.00	-33.00	158.00	255.00	-186.00	419.00	93.00		-7.50		127.00
Skewness	3.97	2.10	5.70	4.03	2.95	6.60	3.69		2.40		5.52
Kurtosis	17.05	-3.74	29.87	19.07	9.88	37.48	16.75		3.30		31.03
Geom. mean	47.12	24.27	61.79	89.83	37.86	121.68	46.71		30.34		57.84
Coeff. var	231.60	176.73	317.65	214.62	154.45	294.12	184.71		143.90		235.08

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
19		19	19	68	68	68	64	64	64
10				7			3		
4342				1316			1594		
9262		-1387	17185	13319	7768	18231	8725	4435	12246
487.47		-73.00	904.47	195.87	114.24	268.10	136.33	69.30	191.34
258.58		0.00	364.91	40.16	25.30	50.50	31.63	0.00	42.12
1270382.00		-204538.60	2529966.00	109672.50	43526.82	173419.40	64012.83	-9406.74	113549.80
1127.11		597.33	2150.31	331.17	243.03	448.03	253.01	135.30	385.70
38.00		6.00	54.00	62.00	24.50	86.00	35.00	-1.00	51.00
18.00		2.00	25.00	24.25	14.50	33.25	15.25	12.00	18.25
150.00		-2231.00	250.00	158.50	13.50	205.00	151.25	82.00	221.00
2.83		1.32	4.40	2.44	1.15	3.22	3.81	2.46	5.78
7.94		-2.95	15.87	4.99	-5.31	8.75	17.91	3.92	33.22
71.68		-24.70	108.83	70.52	43.11	90.01	48.17	28.22	62.13
231.22		116.02	331.89	169.08	142.73	195.55	185.59	142.67	242.50

Movement

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	77	77	77	70	70	70	147	147	147
Min	1			2			2		
Max	96			155			140		
Sum	1552	1197	1868	1339	930	1652	3170	2658	3666
Mean	20.16	15.55	24.26	19.13	13.29	23.60	21.56	18.08	24.94
Std. error	2.25	1.46	2.74	2.64	0.00	3.49	1.76	1.23	2.10
Variance	388.16	164.17	580.17	486.37	-110.18	854.03	456.36	223.71	648.23
Stand. dev	19.70	14.66	25.40	22.05	11.20	33.21	21.36	16.48	26.46
Median	12.00	7.00	14.00	13.00	10.00	16.00	13.00	9.00	15.00
25 prcntil	7.00	6.00	9.00	7.00	4.00	8.00	8.00	7.00	9.00
75 prcntil	31.50	26.00	43.00	21.50	13.75	26.00	31.00	25.00	41.00
Skewness	1.89	1.29	2.87	4.03	2.87	6.83	2.29	1.55	3.26
Kurtosis	4.29	0.67	8.75	21.34	8.37	41.83	7.26	1.71	13.31
Geom. mean	12.81	9.62	15.36	13.30	10.42	15.57	14.56	12.30	16.56
Coeff. var	97.75	82.07	116.56	115.29	86.57	161.00	99.06	84.24	114.82

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
61		61	61	86	86	86	108	108	108
2				2			2		
151				149			168		
1806		1377	2180	1851	1415	2221	2589	1968	3130
29.61		22.57	35.74	21.52	16.45	25.83	23.97	18.22	28.98
3.41		1.47	4.33	2.39	0.67	3.07	2.75	1.52	3.44
707.88		131.28	1141.76	492.25	38.52	810.42	814.63	248.58	1276.11
26.61		17.37	36.66	22.19	13.62	31.18	28.54	19.93	38.29
24.00		17.00	31.00	15.50	12.00	18.50	14.00	12.00	15.00
11.00		5.50	14.00	8.00	4.25	9.00	9.00	8.00	11.00
39.00		30.00	47.00	25.00	20.25	29.75	28.00	19.75	37.25
2.31		1.60	3.98	3.26	2.18	4.97	2.91	2.00	3.85
7.53		1.58	15.33	13.93	2.67	25.50	9.71	1.09	15.79
20.53		15.24	24.79	15.40	12.50	17.80	15.25	12.31	17.67
89.87		70.59	115.60	103.08	81.38	134.31	119.06	102.15	145.00

Foraging

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	35	35	35	26	26	26	35		35		35
Min	3			2			4				
Max	980			764			928				
Sum	5368	2471	7839	4687	2757	6340	5401		2596		7765
Mean	153.37	70.60	223.97	180.27	106.04	243.85	154.31		74.17		221.86
Std. error	40.23	18.29	53.24	35.97	15.31	47.72	38.42		15.67		51.99
Variance	56654.36	11708.75	99212.28	33642.44	6094.73	59209.72	51660.81		8597.74		94621.38
Stand. dev	238.02	157.30	357.32	183.42	119.47	276.98	227.29		146.81		361.31
Median	48.00	7.00	65.00	127.00	47.50	186.50	53.00		-73.00		76.00
25 prcntil	26.00	13.00	32.00	56.75	6.25	103.50	21.00		3.00		28.00
75 prcntil	134.00	-158.00	187.00	238.00	117.50	324.00	210.00		156.00		349.00
Skewness	2.32	0.74	3.35	1.84	0.89	3.26	2.38		1.09		3.79
Kurtosis	4.67	-7.56	9.21	3.58	-3.47	8.16	5.33		-6.19		11.35
Geom. mean	66.02	30.98	88.21	94.07	29.71	136.80	63.55		27.25		86.90
Coeff. var	155.19	122.40	191.85	101.75	76.81	135.89	147.29		116.02		193.13

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
16		16	16	11	11	11	45	45	45
29				10			2		
1325				899			707		
5005		2354	7032	2915	694	4776	7104	4652	9217
312.81		147.13	439.50	265.00	63.09	434.18	157.87	103.38	204.82
78.68		0.00	106.18	98.17	63.41	137.29	26.52	16.46	33.65
99059.50		-26967.00	180382.70	106014.40	44223.11	207346.80	31639.71	12186.74	50957.39
314.74		155.04	496.30	325.60	241.56	582.77	177.88	129.71	244.75
286.00		191.00	495.00	165.00	-101.00	291.00	100.00	79.00	126.00
67.25		-143.50	94.50	39.00	-87.00	68.00	42.50	11.00	66.00
400.50		274.00	507.00	431.00	-37.00	697.00	204.50	89.00	289.00
2.34		1.83	5.28	1.46	-0.09	2.92	1.89	1.02	2.65
7.22		4.68	16.24	0.75	-7.99	3.76	3.18	-2.68	6.22
196.86		69.66	275.49	120.96	-29.00	189.82	77.88	39.62	105.51
100.62		69.50	151.94	122.87	76.15	175.48	112.67	92.19	137.14

Interaction

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	16	16	16	14	14	14	12		12		12
Min	2			5			3				
Max	94			1114			129				
Sum	451	256	613	1404	-871	2607	315		59		481
Mean	28.19	16.00	38.31	100.29	-62.21	186.21	26.25		4.92		40.08
Std. error	5.89	1.58	7.76	78.20	0.00	110.55	9.84		0.00		13.69
Variance	555.10	40.06	962.61	85605.60	-47995.59	171098.50	1160.93		-471.65		2250.62
Stand. dev	23.56	14.41	34.97	292.58	116.97	574.55	34.07		15.29		59.70
Median	19.00	-7.00	23.00	12.50	-12.00	16.50	19.00		6.50		31.50
25 prcntil	12.75	7.00	20.50	7.00	1.00	8.25	5.75		-7.50		8.00
75 prcntil	45.00	37.00	70.00	42.50	-252.00	70.00	31.75		-41.25		44.50
Skewness	1.55	0.62	3.16	3.71	3.68	6.75	2.88		2.61		6.24
Kurtosis	2.90	-1.32	7.55	13.80	13.64	28.93	9.10		7.83		20.17
Geom. mean	19.73	9.05	27.04	20.43	-5.56	30.06	15.63		3.34		22.21
Coeff. var	83.58	58.95	115.16	291.75	264.90	514.40	129.80		97.41		212.67

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
14		14	14	20	20	20	30	30	30
4				1			1		
30				536			1472		
197		142	246	2793	1323	4090	2479	-781	4361
14.07		10.14	17.57	139.65	66.15	204.50	82.63	-26.03	145.37
1.98		1.17	2.61	35.87	20.48	47.05	49.04	0.00	69.13
55.15		19.13	95.61	25726.87	8387.05	44276.94	72154.59	-52948.03	143361.40
7.43		5.30	11.02	160.40	113.27	236.08	268.62	93.10	506.45
13.00		9.50	18.00	69.50	-66.50	115.00	10.50	-5.00	15.00
7.75		2.50	10.00	20.75	-7.00	36.75	5.00	2.00	8.00
18.00		8.25	23.00	228.00	3.25	373.00	29.25	-63.50	41.75
0.92		0.10	2.41	1.45	0.48	2.55	5.10	4.84	8.72
0.63		-3.44	2.86	1.55	-3.56	4.74	27.03	24.89	53.19
12.29		8.41	15.33	56.77	-0.26	86.67	14.43	2.51	20.72
52.77		38.05	74.81	114.86	77.99	149.36	325.07	256.10	517.17

Sebastian

Passive

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	50	50	50	34	34	34	78	78	78
Min	10			7			10		
Max	2002			4565			2434		
Sum	11144	4939	16150	13365	1843	22356	10978	4487	15996
Mean	222.88	98.78	323.00	393.09	54.21	657.53	140.74	57.53	205.08
Std. error	57.38	16.45	75.31	161.31	0.00	224.78	38.77	0.00	52.82
Variance	164640.90	13522.72	283617.30	884676.90	-249668.80	1717898.00	117224.70	-35712.43	217619.80
Stand. dev	405.76	249.59	597.83	940.57	460.22	1654.31	342.38	164.99	555.03
Median	44.00	21.50	56.00	36.50	-32.00	45.00	33.00	24.00	41.00
25 prcntil	25.75	17.50	30.00	21.75	13.50	28.75	18.00	14.00	24.00
75 prcntil	231.75	-25.50	398.50	244.25	-369.75	409.50	85.75	-2.50	121.50
Skewness	2.77	1.40	3.88	3.53	1.83	5.20	4.88	3.06	7.17
Kurtosis	8.08	-3.22	14.60	13.04	-2.71	23.82	27.92	4.78	49.51
Geom. mean	72.49	37.36	94.94	75.83	18.27	107.00	45.25	29.67	56.13
Coeff. var	182.05	138.58	223.55	239.28	162.70	326.49	243.27	187.51	330.72

Holiday								
16-10	Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
53	53	53	78	78	78	64	64	64
6			3			3		
2510			1835			2358		
10082	2693	15735	14344	7854	19981	11697	3913	17848
190.23	50.81	296.89	183.90	100.69	256.17	182.77	61.14	278.88
62.78	0.00	84.73	40.36	19.20	52.57	55.70	0.00	75.18
208895.30	-32555.97	380498.30	127087.20	28761.13	215523.10	198584.60	-10502.49	361692.40
457.05	243.02	720.99	356.49	238.21	516.39	445.63	252.76	702.90
40.00	30.00	51.00	53.50	42.50	72.00	35.50	23.00	45.00
21.50	14.00	27.00	20.00	8.25	24.00	18.00	11.75	22.50
89.50	-95.50	129.00	201.00	134.00	329.25	86.25	44.00	122.25
3.68	1.42	5.20	3.23	1.72	4.23	3.70	1.69	5.05
14.29	-10.39	25.06	10.65	-5.35	17.25	14.33	-7.63	24.30
52.37	27.97	68.05	59.64	36.89	75.93	46.12	25.41	59.67
240.27	179.62	304.44	193.85	160.41	234.34	243.83	184.37	303.93

Movement

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	89	89	89	73	73	73	154		154		154
Min	2			3			2				
Max	125			122			325				
Sum	2245	1801	2652	1701	1346	2016	3771		2813		4547
Mean	25.22	20.24	29.80	23.30	18.44	27.62	24.49		18.27		29.53
Std. error	2.47	1.63	3.00	2.42	1.29	3.04	2.91		0.00		3.80
Variance	542.88	236.68	802.65	428.16	122.29	674.72	1304.27		-102.85		2221.25
Stand. dev	23.30	17.46	29.77	20.69	14.29	27.91	36.11		20.16		52.55
Median	18.00	14.00	22.00	18.00	14.00	22.00	15.00		12.00		18.00
25 prcntil	9.00	6.50	10.00	10.00	7.00	13.00	7.75		6.50		9.50
75 prcntil	32.50	20.00	40.00	29.00	19.00	35.00	26.00		19.00		29.00
Skewness	2.01	1.39	2.90	2.38	1.58	3.71	5.11		3.67		8.23
Kurtosis	4.87	0.69	9.17	7.49	0.94	14.53	34.86		12.31		65.50
Geom. mean	17.45	13.96	20.33	17.20	13.87	19.94	14.57		12.15		16.61
Coeff. var	92.37	78.13	109.85	88.80	71.87	111.42	147.48		113.48		199.22

Holiday										
16-10		Lower conf.	Upper conf.	18-10		Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
115		115	115	145		145	145	132	132	132
1				2				3		
195				114				189		
2814		2122	3398	2897		2400	3362	3268	2620	3832
24.47		18.45	29.55	19.98		16.55	23.19	24.76	19.85	29.03
2.84		1.39	3.58	1.70		1.32	1.97	2.35	1.26	2.93
929.16		222.65	1477.59	418.52		253.68	563.00	731.80	209.55	1132.97
30.48		20.52	41.45	20.46		16.76	24.36	27.05	18.69	35.92
14.00		10.00	17.00	12.00		9.00	15.00	15.00	10.00	18.00
7.00		5.00	8.00	7.00		6.00	9.00	8.00	6.00	9.00
29.00		20.00	34.00	26.00		18.00	33.50	30.75	21.50	35.50
3.14		2.29	4.51	1.85		1.27	2.43	3.10	2.33	4.89
12.28		3.37	21.41	3.48		-0.23	6.42	13.53	5.46	25.98
14.60		11.62	17.03	12.91		10.76	14.74	16.23	13.49	18.51
124.57		104.19	154.61	102.39		90.80	114.30	109.27	89.07	135.86

Foraging

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	46	46	46	29	29	29	36		36		36
Min	2			3			1				
Max	600			549			1012				
Sum	4230	2098	6068	4911	2914	6817	5741		2676		8421
Mean	91.96	45.61	131.91	169.34	100.48	235.07	159.47		74.33		233.92
Std. error	22.31	12.38	28.99	35.54	28.27	43.74	41.23		17.21		55.72
Variance	22902.84	7051.23	38669.10	36621.52	23180.77	55487.56	61185.28		10665.67		111779.20
Stand. dev	151.34	105.81	218.20	191.37	158.99	249.49	247.36		160.49		391.80
Median	31.50	16.50	41.00	83.00	-9.00	132.00	62.50		5.00		96.00
25 prcntil	17.25	9.50	29.50	20.50	-10.50	29.00	16.25		-8.50		26.50
75 prcntil	69.50	-49.75	96.00	256.50	-8.00	389.00	173.50		31.00		256.00
Skewness	2.35	0.79	3.26	1.11	0.12	1.81	2.45		1.07		3.64
Kurtosis	4.64	-7.56	8.73	-0.27	-4.70	1.10	5.70		-6.43		11.19
Geom. mean	32.64	15.22	43.99	73.04	23.29	103.83	52.56		14.69		75.35
Coeff. var	164.57	132.49	198.05	113.00	83.33	138.64	155.11		119.74		200.58

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
28		28	28	23	23	23	42	42	42
2				1			2		
937				600			875		
4061		1829	5790	2710	1295	3913	6632	3467	9469
145.04		65.32	206.79	117.83	56.30	170.13	157.90	82.55	225.45
36.94		0.00	50.24	29.76	3.58	39.02	36.86	25.74	45.75
38203.22		-7733.66	70671.03	20373.24	294.46	35018.77	57066.67	27823.99	87908.85
195.46		100.84	315.18	142.73	84.34	209.79	238.89	183.99	315.83
67.50		-15.50	95.00	82.00	53.00	145.00	22.00	-29.50	32.00
36.50		26.00	53.00	7.00	-39.00	12.00	8.25	3.50	12.50
193.00		128.50	267.00	190.00	111.00	294.00	231.50	19.00	409.25
2.92		1.91	5.30	1.96	1.08	3.64	1.58	0.57	2.31
10.05		2.14	21.26	4.86	-0.03	11.19	1.44	-3.72	3.67
72.13		29.96	99.87	39.32	-2.76	60.94	34.53	6.88	49.76
134.76		100.87	191.88	121.14	82.05	162.61	151.29	105.28	185.33

Interaction

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	27	27	27	16	16	16	27		27		27
Min	6			3			4				
Max	132			626			72				
Sum	755	431	1012	919	-350	1612	509		335		658
Mean	27.96	15.96	37.48	57.44	-21.88	100.75	18.85		12.41		24.37
Std. error	5.62	0.00	7.72	38.08	0.00	53.79	3.23		1.42		4.31
Variance	851.96	-11.86	1608.36	23207.06	-14326.53	46286.90	281.13		54.35		501.49
Stand. dev	29.19	16.95	48.60	152.34	58.22	293.40	16.77		11.00		25.74
Median	20.00	13.00	28.00	17.00	1.00	24.00	14.00		8.00		19.00
25 prcntil	11.00	6.00	13.00	6.25	-3.50	9.50	9.00		8.00		12.00
75 prcntil	35.00	-3.00	50.00	40.50	36.00	63.50	25.00		21.00		34.00
Skewness	2.52	1.09	4.40	3.94	3.90	7.81	1.97		0.96		3.34
Kurtosis	6.50	-5.10	13.71	15.63	15.46	33.04	3.83		-3.82		8.52
Geom. mean	19.93	13.08	24.84	17.27	0.68	24.97	13.92		9.28		17.32
Coeff. var	104.38	84.87	156.85	265.23	235.53	470.41	88.94		71.39		122.44

Holiday									
16-10		Lower conf.	Upper conf.	18-10		Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
17		17	17	17		17	17	37	37	37
3				1				1		
81				170				690		
386		215	520	469		101	743	2068	238	3420
22.71		12.65	30.59	27.59		5.94	43.71	55.89	6.43	92.43
4.73		0.00	6.26	10.30		0.00	14.22	22.49	0.00	31.45
380.22		-13.32	666.33	1802.01		-459.49	3436.79	18708.88	-6256.61	36606.12
19.50		11.18	29.30	42.45		21.15	71.97	136.78	64.58	245.07
14.00		-6.00	16.00	11.00		-5.00	19.00	7.00	-5.00	8.00
11.00		8.50	18.00	2.50		-5.00	4.00	4.50	2.50	6.50
35.00		26.00	53.00	36.00		-3.00	58.50	30.50	-26.00	47.00
1.80		0.98	3.61	2.69		1.85	4.70	3.65	1.70	5.31
4.07		0.08	9.82	8.12		2.87	17.36	14.02	-4.72	25.27
16.33		8.42	21.67	10.28		-0.24	15.44	12.57	4.08	17.41
85.88		61.73	119.33	153.87		105.11	220.09	244.72	170.25	342.31

Laura

Passive behaviour

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	103	103	103	54	54	54	63		63		63
Min	2			5			7				
Max	1351			3601			1320				
Sum	10833	5587	15219	14978	4541	23068	6357		2648		9225
Mean	105.17	54.24	147.76	277.37	84.09	427.19	100.90		42.03		146.43
Std. error	23.99	10.73	31.21	89.11	0.00	120.33	27.29		0.00		37.47
Variance	59286.81	11850.14	100314.40	428828.90	-51197.98	781911.50	46923.35		-6983.71		88469.44
Stand. dev	243.49	160.29	351.85	654.85	356.36	1034.48	216.62		115.70		359.91
Median	31.00	25.00	37.00	48.50	25.00	60.00	26.00		10.00		30.00
25 prcntil	18.00	16.00	23.00	25.00	12.50	31.75	19.00		16.00		25.00
75 prcntil	57.00	28.00	71.00	128.50	-47.00	186.75	75.00		-12.00		105.00
Skewness	3.81	1.74	4.96	3.60	1.73	5.08	4.13		2.10		6.03
Kurtosis	14.52	-9.52	22.99	14.04	-5.45	24.65	18.73		-5.61		33.55
Geom. mean	37.13	26.89	44.88	69.01	33.78	90.43	39.86		25.97		49.28
Coeff. var	231.51	196.88	274.61	236.09	172.64	296.32	214.68		172.17		303.34

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
66		66	66	85	85	85	105	105	105
9				11			2		
3546				3149			1066		
12066		1807	19409	15526	6307	22642	9218	4922	12837
182.82		27.38	294.08	182.66	74.20	266.38	87.79	46.88	122.26
69.58		0.00	97.03	50.05	0.00	67.28	19.53	9.08	25.53
319499.10		-114898.80	621338.50	212907.70	-38352.39	384740.00	40051.26	8649.49	68429.77
565.24		262.21	997.60	461.42	241.54	720.17	200.13	132.95	292.22
39.50		32.00	46.00	36.00	14.00	44.00	30.00	23.00	36.00
22.75		14.25	28.75	23.00	20.00	27.00	16.00	11.50	18.50
64.25		32.50	78.50	87.50	-20.00	109.50	46.50	29.00	54.00
5.04		2.76	7.36	4.51	2.62	6.25	3.86	1.56	5.04
26.40		-3.66	46.51	23.22	0.00	39.44	14.42	-13.45	23.05
48.57		30.34	60.72	54.92	37.13	67.29	34.19	25.65	40.78
309.18		240.48	446.91	252.61	198.59	321.09	227.96	201.05	264.89

Movement

Control												
	30-09	Lower conf.	Upper conf.	02-10	Lowe conf.	r	Upper conf.	05-10		Lower conf.		Upper conf.
N	136	136	136	80	80		80	132		132		132
Min	1			3				3				
Max	126			96				138				
Sum	2859	2370	3295	1440	1162		1679	2825		2321		3280
Mean	21.02	17.43	24.23	18.00	14.53		20.99	21.40		17.58		24.85
Std. error	1.73	1.16	2.09	1.65	0.68		2.09	1.86		1.18		2.28
Variance	408.33	183.28	592.41	218.51	37.52		348.71	455.45		182.26		686.45
Stand. dev	20.21	15.25	25.44	14.78	9.58		20.17	21.34		15.69		27.70
Median	14.00	11.00	15.50	14.00	10.50		17.00	15.00		14.00		17.00
25 prcntil	8.25	6.50	9.50	8.00	5.75		9.75	8.25		6.25		8.50
75 prcntil	26.25	21.00	30.50	24.00	21.00		29.00	25.75		19.50		31.50
Skewness	2.41	1.71	3.19	2.65	1.83		4.29	2.79		2.02		3.71
Kurtosis	7.17	1.32	11.90	10.16	2.29		18.94	9.62		2.23		15.70
Geom. mean	14.86	12.60	16.76	13.97	11.63		15.96	15.45		13.28		17.36
Coeff. var	96.12	82.86	112.63	82.12	64.07		105.41	99.72		84.76		120.31

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
93		93	93	101	101	101	172	172	172
2				2			2		
226				151			147		
2621		1888	3236	2124	1614	2564	3596	3005	4118
28.18		20.30	34.80	21.03	15.98	25.39	20.91	17.47	23.94
3.76		1.72	4.75	2.37	1.04	3.04	1.62	1.06	1.96
1313.39		275.10	2099.89	569.27	108.81	932.37	452.86	194.44	657.82
36.24		23.99	49.53	23.86	15.63	33.36	21.28	15.89	26.82
16.00		13.00	19.00	15.00	13.00	19.00	14.00	13.00	16.00
10.00		7.50	13.50	7.50	5.00	9.00	8.00	6.00	9.00
28.00		18.50	34.00	22.00	15.50	25.00	26.75	22.75	32.50
3.02		1.95	4.22	3.24	2.26	4.70	2.75	2.00	3.73
10.98		0.86	19.45	12.87	2.45	22.66	10.01	3.00	16.75
16.86		13.04	19.88	14.27	11.65	16.47	14.44	12.45	16.17
128.59		107.07	157.42	113.46	93.90	145.00	101.79	86.77	119.67

Foraging

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	28	28	28	20	20	20	42	42	42
Min	6			6			9		
Max	662			487			740		
Sum	3165	1421	4572	3175	1772	4373	5192	2944	7038
Mean	113.04	50.75	163.29	158.75	88.60	218.65	123.62	70.10	167.57
Std. error	29.35	5.01	39.45	34.05	24.26	43.54	24.81	10.93	31.96
Variance	24117.67	702.08	43577.29	23181.25	11771.21	37921.59	25862.44	5013.41	42902.21
Stand. dev	155.30	92.58	242.35	152.25	118.52	212.63	160.82	105.51	227.71
Median	52.00	-0.50	77.50	120.00	63.50	184.50	51.00	11.00	65.50
25 prcntil	21.50	13.25	33.00	37.25	-16.25	62.00	22.50	8.00	27.00
75 prcntil	157.50	28.25	248.25	197.25	-45.00	249.75	158.00	19.00	240.25
Skewness	2.33	1.11	3.64	1.13	0.12	2.03	2.18	1.20	3.26
Kurtosis	5.68	-3.54	11.52	0.11	-5.51	1.92	5.08	-1.62	10.12
Geom. mean	52.07	19.68	71.66	90.03	27.89	127.77	61.52	34.40	80.05
Coeff. var	137.39	103.90	181.33	95.91	70.59	122.16	130.09	102.11	160.89

Holiday									
16-10		Lower conf.	Upper conf.	18-10		Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
22		22	22	12		12	12	49	49	49
22				14				1		
577				549				1166		
3067		1389	4425	2285		1018	3455	5544	2472	7873
139.41		63.14	201.14	190.42		84.83	287.92	113.14	50.45	160.67
36.64		19.60	50.54	54.18		38.75	70.20	28.67	0.00	39.35
29533.11		8453.51	56191.92	35226.81		18021.17	59143.36	40284.67	-11362.04	75863.44
171.85		118.73	290.09	187.69		146.39	269.03	200.71	98.22	332.82
69.00		9.00	98.00	87.50		-140.50	129.50	70.00	56.00	112.00
38.25		29.50	51.75	44.25		-18.50	74.00	11.50	-8.00	16.00
157.25		-188.25	220.25	325.25		123.00	553.25	118.50	80.50	153.00
1.97		0.33	3.25	0.82		-0.62	1.94	3.95	2.43	6.47
2.78		-9.37	6.89	-0.72		-6.25	0.67	17.64	1.20	33.40
80.89		38.31	107.60	102.94		4.26	154.95	42.42	20.44	57.34
123.27		100.51	176.82	98.57		58.19	134.56	177.40	141.32	259.07

Stereotype behaviour

	Control			**Holiday**		
	05-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
N	6	6	6	6	6	6
Min	34			33		
Max	331			211		
Sum	758	234	1139	600	299	846
Mean	126.33	39.00	189.83	100.00	49.83	141.00
Std. error	43.43	16.78	60.59	25.59	11.50	35.33
Variance	11314.67	1689.17	22027.57	3930.00	792.93	7488.90
Stand. dev	106.37	68.03	188.21	62.69	41.31	106.12
Median	109.00	-8.50	174.50	86.00	3.50	126.50
25 prcntil	48.25	-17.00	62.50	51.75	15.50	70.50
75 prcntil	174.25	17.50	244.00	147.25	83.50	210.50
Skewness	1.84	1.28	5.72	1.22	0.28	3.69
Kurtosis	3.90	1.98	11.08	1.71	-1.84	6.46
Geom. mean	97.49	25.77	139.55	84.96	36.01	116.97
Coeff. var	84.20	57.74	143.27	62.69	40.01	103.86

Interaction

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	14	14	14	11	11	11	14	14	14
Min	5			3			9		
Max	319			1114			499		
Sum	702	29	1127	1371	-844	2541	1150	95	1857
Mean	50.14	2.07	80.50	124.64	-76.73	231.00	82.14	6.79	132.64
Std. error	21.79	0.00	30.59	99.08	0.00	140.06	34.73	0.00	48.61
Variance	6650.29	-2966.60	13099.85	107983.10	-45199.91	215786.10	16888.75	-6417.61	33075.01
Stand. dev	81.55	35.56	148.93	328.61	146.17	643.80	129.96	59.43	233.41
Median	23.50	2.00	35.50	26.00	7.00	43.00	26.00	-27.00	33.00
25 prcntil	11.00	-0.25	15.50	9.00	-8.00	15.00	16.75	7.50	23.75
75 prcntil	48.75	-56.50	71.50	45.00	-1024.00	64.00	85.50	-96.25	145.00
Skewness	3.16	2.75	5.87	3.30	3.29	7.20	2.93	2.32	5.31
Kurtosis	10.68	8.26	22.72	10.92	10.87	23.79	9.23	5.67	19.86
Geom. mean	25.22	4.82	35.73	25.44	-14.92	39.86	39.29	5.34	56.52
Coeff. var	162.63	124.61	263.17	263.65	243.44	478.88	158.21	115.81	246.18

Holiday									
16-10	Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.	
13	13	13	14	14	14	31	31	31	
3			5			1			
108			538			1788			
451	215	663	1493	331	2416	3175	-745	5503	
34.69	16.54	51.00	106.64	23.64	172.57	102.42	-24.03	177.52	
9.08	5.21	11.83	40.76	0.00	55.55	57.85	0.00	81.63	
1072.90	353.23	1819.82	23253.79	-860.65	43193.51	103740.80	-74008.83	206589.00	
32.76	23.17	47.46	152.49	87.34	247.42	322.09	113.62	614.30	
25.00	-2.00	42.00	34.50	-70.00	50.50	25.00	14.00	40.00	
6.50	-12.00	10.00	17.75	-1.25	29.00	9.00	3.00	16.00	
60.50	30.50	95.50	211.75	96.25	380.50	57.00	-23.00	86.00	
1.04	-0.03	2.18	2.05	0.73	3.73	5.12	4.74	8.57	
0.41	-4.10	2.65	4.31	-3.36	10.61	27.25	24.06	52.56	
19.86	2.67	29.55	43.64	-0.82	65.06	21.45	4.50	30.60	
94.42	57.99	128.26	142.99	89.76	196.59	314.48	249.21	524.69	

My

Passive behaviour

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	58	58	58	44	44	44	81		81		81
Min	10			10			9				
Max	930			3977			1216				
Sum	7431	4230	10178	11379	533	19553	6505		3046		9092
Mean	128.12	72.93	175.48	258.61	12.11	444.39	80.31		37.60		112.25
Std. error	26.29	13.13	33.80	113.88	0.00	159.10	19.17		0.00		26.09
Variance	40100.84	10006.60	66276.35	570653.70	-178860.00	1113823.00	29753.52		-9835.04		55136.51
Stand. dev	200.25	135.56	282.50	755.42	361.85	1345.05	172.49		81.66		278.87
Median	42.50	15.00	55.50	38.00	28.00	51.00	27.00		15.00		32.00
25 prcntil	20.00	11.00	22.00	20.00	14.75	25.25	17.00		13.50		21.00
75 prcntil	117.00	-55.00	157.75	77.25	-110.75	109.00	56.50		13.50		71.50
Skewness	2.54	1.38	3.47	4.09	1.82	5.85	4.82		3.03		7.09
Kurtosis	6.47	-2.79	11.42	17.09	-7.28	30.04	26.75		2.93		47.24
Geom. mean	56.10	34.82	70.56	51.07	23.78	67.79	35.54		25.78		42.62
Coeff. var	156.30	128.24	188.40	292.10	194.31	396.67	214.79		172.13		300.33

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
43		43	43	106	106	106	66	66	66
6				10			2		
3235				2042			1395		
9272		105	16246	13689	7195	18876	6436	2888	9083
215.63		2.44	377.81	129.14	67.88	178.08	97.52	43.76	137.62
97.54		0.00	136.64	28.82	0.00	39.39	24.73	0.00	33.31
409140.50		-99622.79	802809.60	88036.45	-13355.63	164473.70	40367.08	-12603.31	73231.98
639.64		321.21	1154.90	296.71	158.18	485.72	200.92	96.32	315.22
20.00		12.00	26.00	36.50	13.00	43.00	21.50	8.00	26.00
10.00		5.00	12.00	18.75	11.50	20.50	14.00	11.25	15.25
51.00		-120.00	79.00	131.75	91.25	193.50	96.50	38.50	150.50
3.87		1.41	5.51	5.34	3.15	7.85	4.68	3.37	7.51
15.09		-10.71	26.59	31.43	-3.51	53.90	27.10	13.08	51.86
31.08		11.19	42.40	52.05	38.63	62.37	36.06	22.90	45.30
296.64		182.72	397.65	229.76	194.45	330.92	206.04	156.07	279.46

Movement

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	104	104	104	97	97	97	201	201	201
Min	2			1			2		
Max	449			139			218		
Sum	3974	2747	4951	2438	1904	2937	4485	3774	5098
Mean	38.21	26.41	47.61	25.13	19.63	30.28	22.31	18.78	25.36
Std. error	5.50	0.00	7.19	2.70	1.77	3.31	1.67	0.76	2.06
Variance	3148.11	-452.87	5372.60	709.16	305.09	1062.38	562.70	116.34	849.76
Stand. dev	56.11	30.06	81.82	26.63	19.89	34.39	23.72	15.68	30.84
Median	23.50	18.00	28.00	16.00	11.00	20.00	14.00	10.00	16.00
25 prcntil	10.00	7.00	13.00	8.00	6.00	10.00	9.00	8.00	10.50
75 prcntil	40.00	28.25	47.00	31.50	20.00	38.00	29.00	25.00	34.50
Skewness	4.59	3.32	7.29	2.19	1.54	2.94	3.81	2.73	6.02
Kurtosis	28.49	12.85	53.78	5.46	0.67	9.24	23.87	11.88	45.46
Geom. mean	21.10	16.20	25.14	15.69	12.26	18.57	15.36	13.41	17.07
Coeff. var	146.84	110.96	195.34	105.95	90.45	125.02	106.31	82.07	130.32

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
141		141	141	150	150	150	159	159	159
2				1			1		
213				259			231		
2620		2061	3062	3807	2972	4518	3693	2855	4395
18.58		14.62	21.72	25.38	19.81	30.12	23.23	17.96	27.64
1.82		0.00	2.37	2.65	0.95	3.38	2.47	1.17	3.11
468.45		-100.47	791.26	1052.14	135.60	1715.67	971.13	217.13	1535.61
21.64		11.08	31.22	32.44	20.50	45.16	31.16	20.79	42.16
13.00		12.00	16.00	16.00	13.00	19.50	14.00	11.00	17.00
7.50		6.00	10.00	9.00	8.00	11.00	7.00	6.00	9.00
25.00		23.50	30.00	30.25	27.50	35.25	27.00	22.00	32.00
5.61		4.65	10.08	4.12	3.00	6.30	3.81	2.83	5.44
46.44		32.84	92.24	22.76	7.48	41.48	18.72	6.12	32.04
12.86		10.97	14.53	16.03	13.50	18.22	13.58	11.17	15.56
116.48		78.53	159.54	127.80	102.61	165.05	134.17	111.70	167.55

Foraging

Control											
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10		Lower conf.		Upper conf.
N	38	38	38	38	38	38	44		44		44
Min	2			3			2				
Max	879			606			741				
Sum	3566	1268	5377	5428	3109	7489	4550		2173		6505
Mean	93.84	33.37	141.50	142.84	81.82	197.08	103.41		49.39		147.84
Std. error	28.57	0.00	39.28	29.68	21.04	36.83	26.00		10.04		35.04
Variance	31015.06	-4248.15	58634.68	33477.11	16820.78	51556.14	29738.62		4434.47		54023.00
Stand. dev	176.11	94.78	293.95	182.97	142.03	241.85	172.45		110.29		271.05
Median	27.50	15.50	34.50	52.00	-49.50	89.00	41.00		17.50		56.00
25 prcntil	17.75	13.25	30.50	10.00	-2.75	13.25	21.25		15.75		33.75
75 prcntil	94.00	2.75	153.00	200.25	41.00	280.50	81.75		-24.00		109.00
Skewness	3.25	1.57	4.84	1.45	0.59	2.13	2.77		1.01		3.87
Kurtosis	11.43	-4.37	21.34	1.07	-3.39	3.03	7.15		-9.67		12.91
Geom. mean	32.10	13.37	43.81	48.36	14.33	68.15	41.10		20.49		54.77
Coeff. var	187.67	142.43	256.96	128.09	95.90	155.97	166.76		138.19		216.22

Holiday									
16-10		Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.	20-10	Lower conf.	Upper conf.
53		53	53	25	25	25	41	41	41
2				3			3		
635				671			639		
3747		2061	5148	2783	1207	4043	5222	3006	7089
70.70		38.89	97.13	111.32	48.28	161.72	127.37	73.32	172.90
15.26		0.00	19.97	29.81	0.00	39.81	25.67	13.13	33.52
12341.29		-237.11	21143.89	22223.14	-1620.97	39630.59	27018.84	7064.39	46060.05
111.09		64.32	162.70	149.07	83.52	228.75	164.37	112.01	239.43
22.00		-8.00	29.00	51.00	5.00	72.00	60.00	6.00	83.00
9.50		4.00	12.50	18.50	-6.00	23.00	30.50	20.00	48.00
85.50		31.00	121.00	173.50	64.00	295.00	149.00	62.00	197.00
3.12		2.01	4.92	2.52	1.56	4.36	2.18	1.11	3.13
12.44		2.62	24.24	7.64	1.63	16.54	4.33	-4.62	8.40
27.26		14.57	36.12	54.17	20.59	75.26	61.50	32.18	81.82
157.13		119.02	202.65	133.92	96.66	178.80	129.06	105.75	161.26

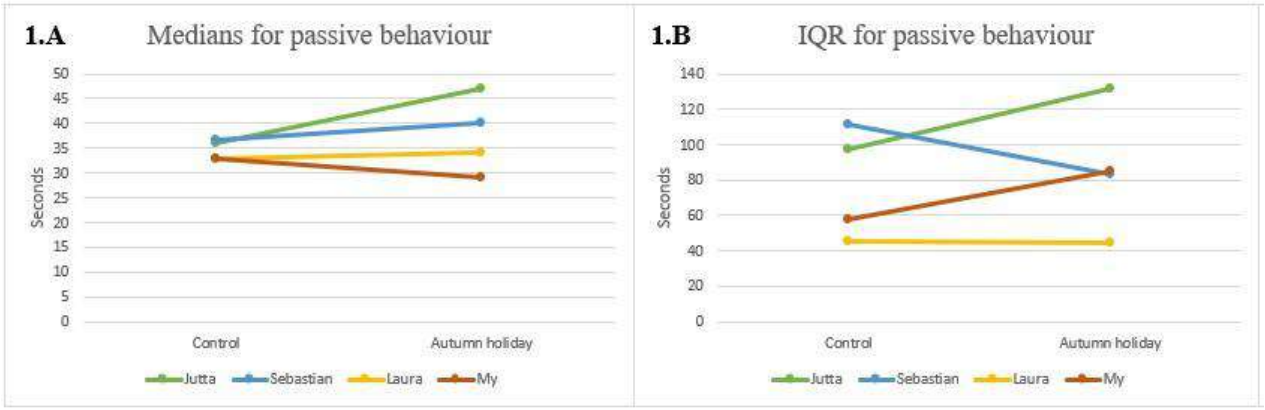
Reaction to guests/zookeepers

Control							**Holiday**		
	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.	16-10	Lower conf.	Upper conf.
N	6	6	6	7	7	7	20	20	20
Min	19			3			2		
Max	88			33			36		
Sum	229	100	317	111	51	166	271	180	354
Mean	38.17	16.67	52.83	15.86	7.29	23.71	13.55	9.00	17.70
Std. error	10.50	4.62	14.68	4.55	3.57	6.06	2.29	1.64	2.86
Variance	661.37	128.03	1292.73	144.81	89.05	257.14	105.31	53.80	163.64
Stand. dev	25.72	16.87	45.96	12.03	9.91	18.37	10.26	8.00	13.67
Median	30.50	-3.00	41.00	10.00	-9.00	15.00	10.00	2.50	13.50
25 prcntil	20.50	6.00	22.00	5.00	-12.00	7.00	6.00	3.00	10.00
75 prcntil	52.00	16.00	75.75	29.00	25.00	49.00	19.50	9.00	25.00
Skewness	1.94	1.49	4.88	0.48	-1.32	2.22	0.80	-0.02	1.56
Kurtosis	4.01	2.26	11.21	-1.79	-9.22	-0.89	-0.31	-3.35	0.92
Geom. mean	32.94	13.86	42.97	11.61	1.81	17.07	9.64	5.15	12.80
Coeff. var	67.38	53.13	117.60	75.89	45.37	113.50	75.74	55.61	96.82

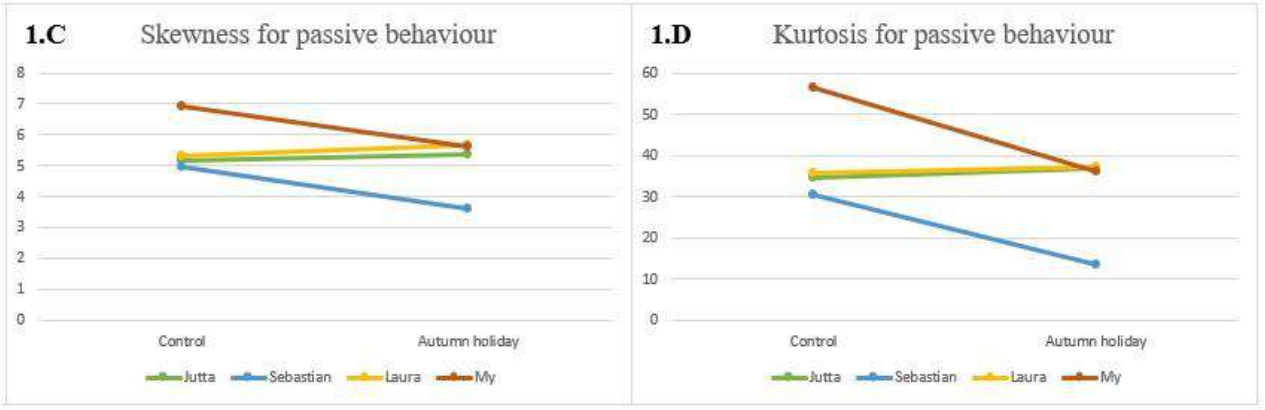
Interaction

Control									
	30-09	Lower conf.	Upper conf.	02-10	Lower conf.	Upper conf.	05-10	Lower conf.	Upper conf.
N	14	14	14	19	19	19	30	30	30
Min	10			2			3		
Max	98			78			499		
Sum	461	265	612	424	225	601	1253	135	1990
Mean	32.93	18.93	43.71	22.32	11.84	31.63	41.77	4.50	66.33
Std. error	6.62	1.96	9.17	5.22	3.27	6.79	16.95	0.00	23.73
Variance	612.99	53.96	1177.77	517.67	203.06	876.21	8615.50	-4879.61	16892.25
Stand. dev	24.76	15.28	42.57	22.75	16.66	32.89	92.82	36.94	167.23
Median	27.00	20.50	33.00	14.00	0.00	24.00	14.50	10.00	19.50
25 prcntil	19.00	11.00	25.75	3.00	-7.00	4.00	7.00	4.00	10.00
75 prcntil	35.00	-12.25	43.00	28.00	-5.00	34.00	28.00	-23.00	40.00
Skewness	1.95	0.79	4.47	1.23	0.26	2.14	4.46	3.76	7.41
Kurtosis	3.43	-3.87	8.42	0.72	-4.23	2.90	21.74	15.99	42.52
Geom. mean	26.99	16.56	34.07	12.00	3.51	17.10	16.49	7.52	22.04
Coeff. var	75.19	59.98	121.62	101.96	69.68	132.52	222.23	170.51	346.67
Holiday									
16-10	Lower conf.	Upper conf.	18-10	Lower conf.	Upper conf.		20-10	Lower conf.	Upper conf.
38	38	38	12	12	12		58	58	58
1			1				1		
193			512				1788		
632	198	899	1130	50	1936		4806	297	7928
16.63	5.21	23.66	94.17	4.17	161.33		82.86	5.12	136.69
5.00	0.00	6.99	43.64	0.00	60.93		34.40	0.00	47.73
951.75	-663.04	1854.21	22852.52	-3163.70	44546.61		68651.21	-35506.12	132158.20
30.85	11.04	54.68	151.17	81.28	268.31		262.01	108.33	452.30
10.00	6.50	13.50	23.50	-71.00	43.00		9.00	0.00	12.00
4.00	0.00	5.00	3.50	-19.00	5.75		3.75	1.75	5.50
18.00	12.50	24.00	138.50	-167.00	249.75		26.00	-8.00	33.75
5.32	4.96	10.01	2.27	1.29	4.04		5.36	3.96	8.25
30.73	27.56	61.90	5.42	-0.05	12.54		32.59	17.12	60.11
9.16	5.64	11.68	22.47	-20.78	37.36		12.58	5.29	16.91
185.49	151.39	306.19	160.54	92.98	226.39		316.20	224.50	435.05

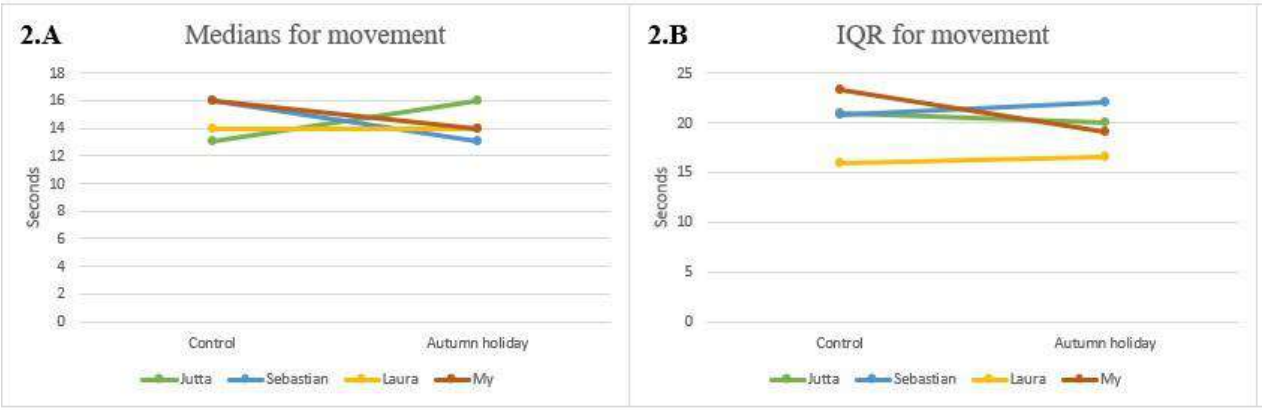
Appendix G


1.A
Medians for passive behaviour
Seconds
Control
Autumn holiday
Jutta
Sebastian
Laura
My

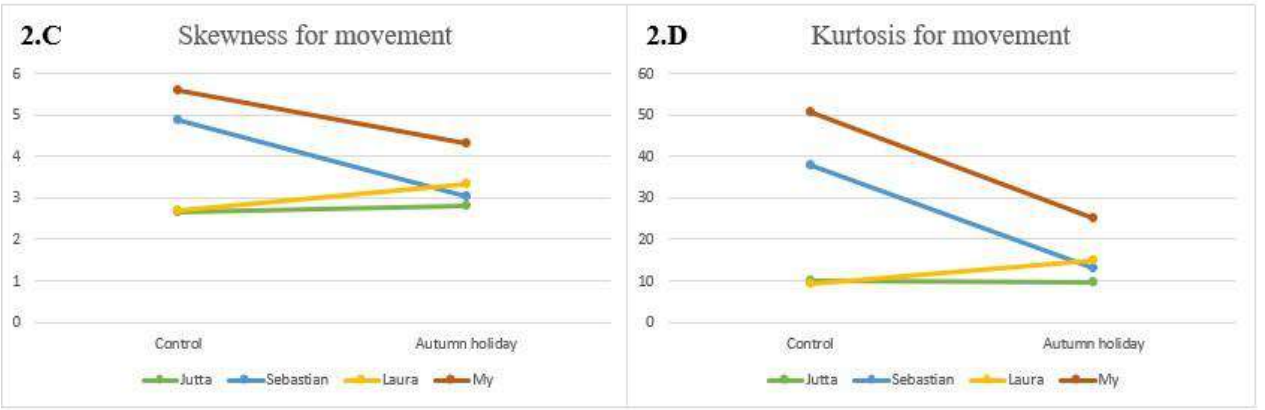
1.B
IQR for passive behaviour
Seconds
Control
Autumn holiday
Jutta
Sebastian
Laura
My


1.C
Skewness for passive behaviour
Control
Autumn holiday
Jutta
Sebastian
Laura
My

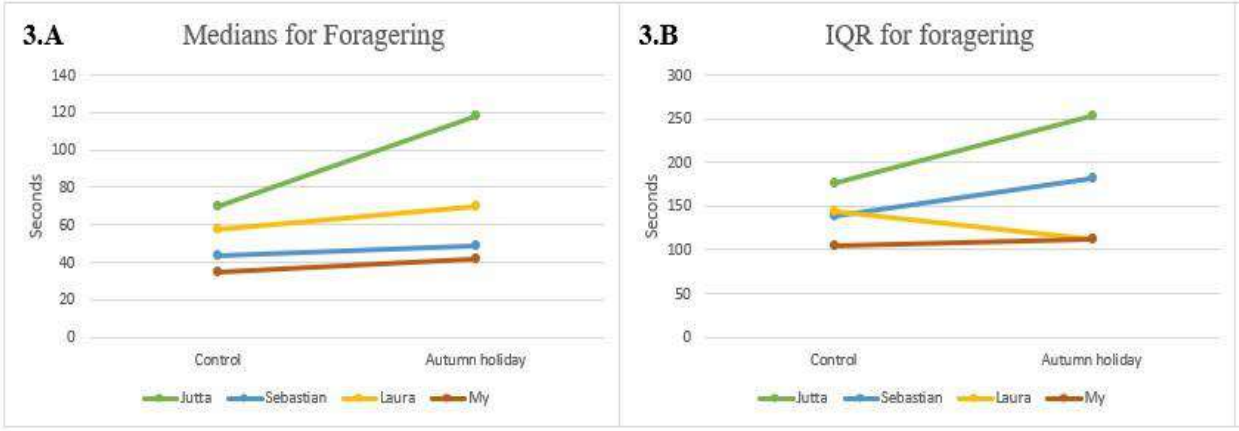
1.D
Kurtosis for passive behaviour
Control
Autumn holiday
Jutta
Sebastian
Laura
My


2.A
Medians for movement
Seconds
Control
Autumn holiday
Jutta
Sebastian
Laura
My

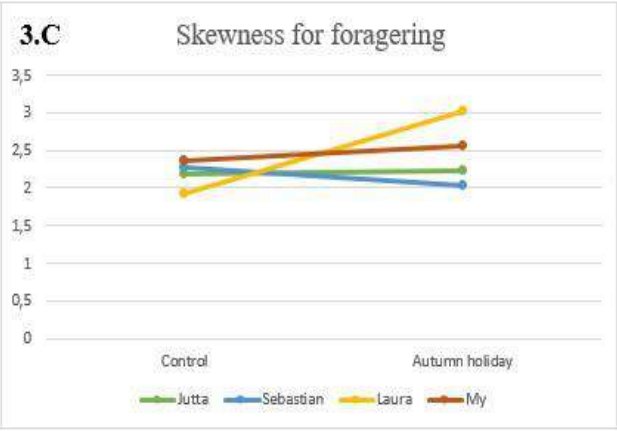
2.B
IQR for movement
Seconds
Control
Autumn holiday
Jutta
Sebastian
Laura
My

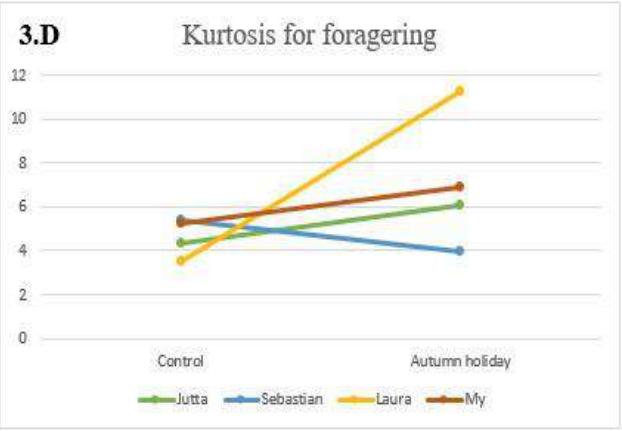

2.C
Skewness for movement
Control
Autumn holiday
Jutta
Sebastian
Laura
My

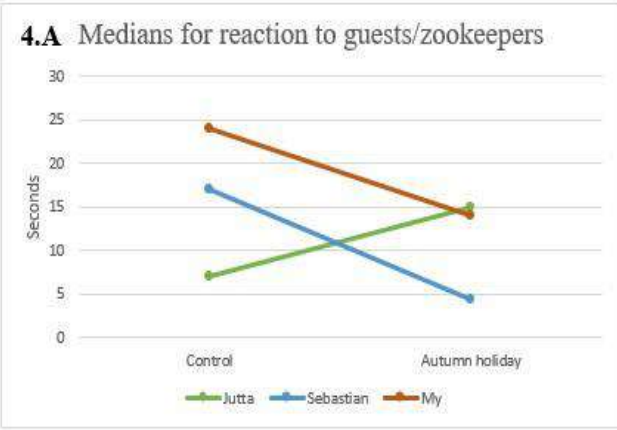
2.D
Kurtosis for movement
Control
Autumn holiday
Jutta
Sebastian
Laura
My

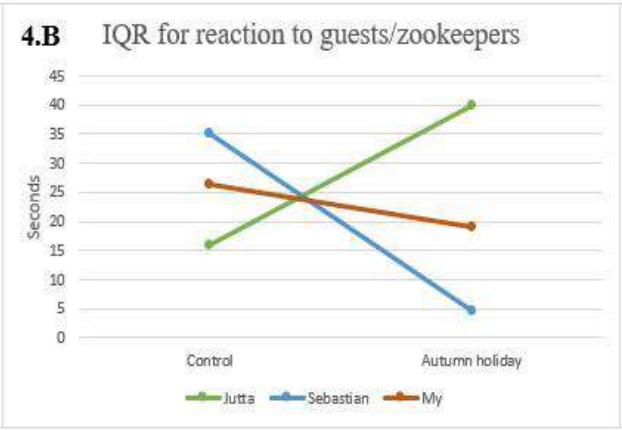

3.A
Medians for Foragering
Seconds
140
120
100
80
60
40
20
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My

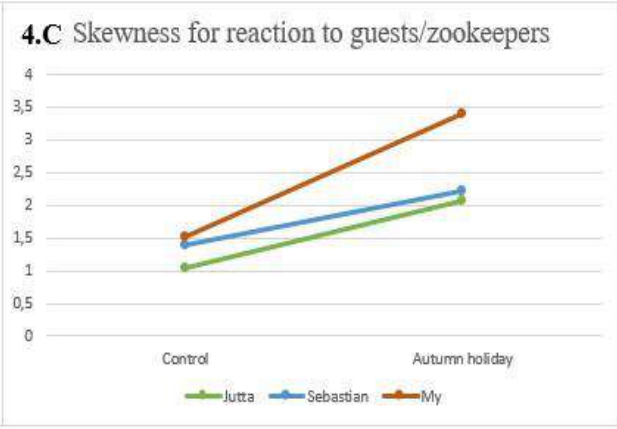
3.B
IQR for foragering
Seconds
300
250
200
150
100
50
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My

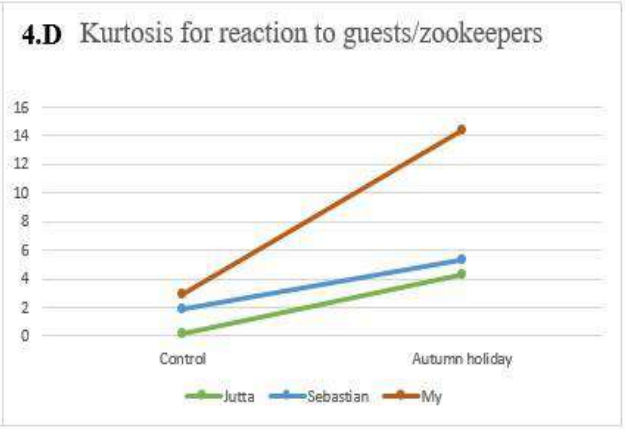

3.C
Skewness for foragering
3,5
3
2,5
2
1,5
1
0,5
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My

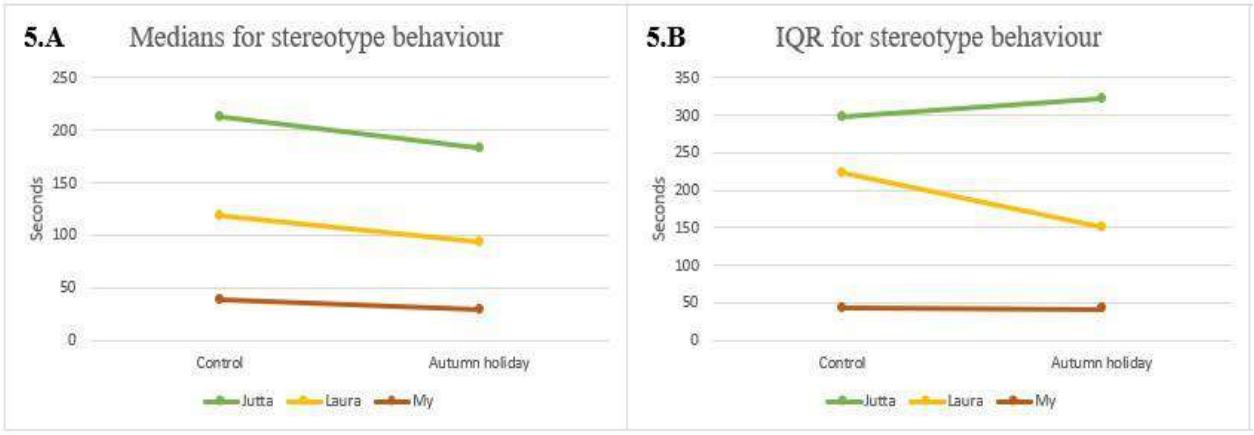

3.D
Kurtosis for foragering
12
10
8
6
4
2
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My

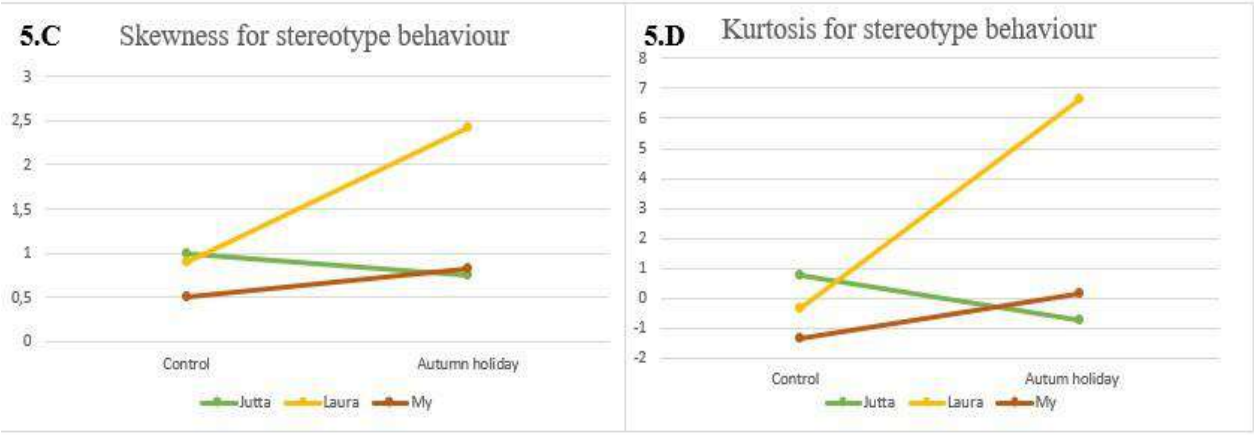

4.A
Medians for reaction to guests/zookeepers
Seconds
30
25
20
15
10
5
0
Control
Autumn holiday
Jutta
Sebastian
My

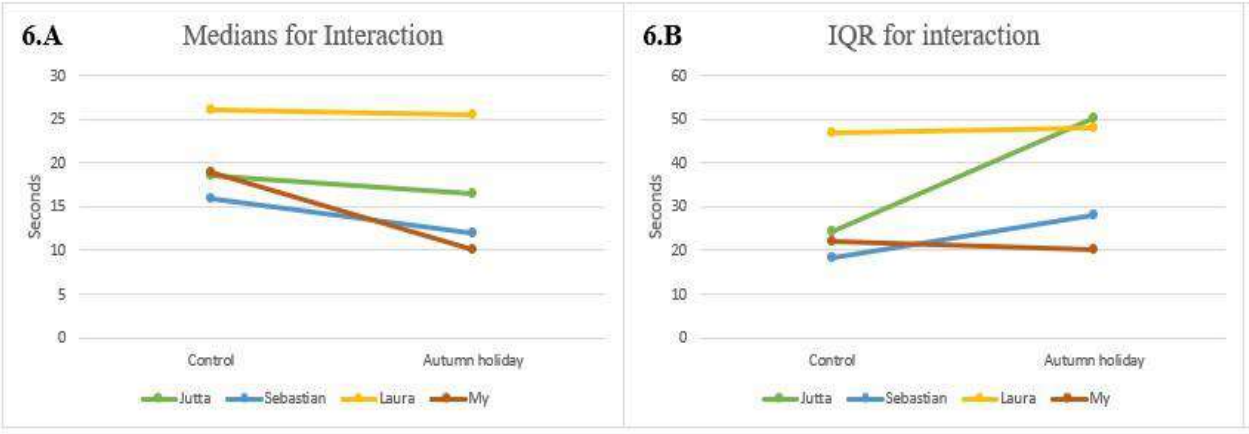

4.B
IQR for reaction to guests/zookeepers
Seconds
45
40
35
30
25
20
15
10
5
0
Control
Autumn holiday
Jutta
Sebastian
My

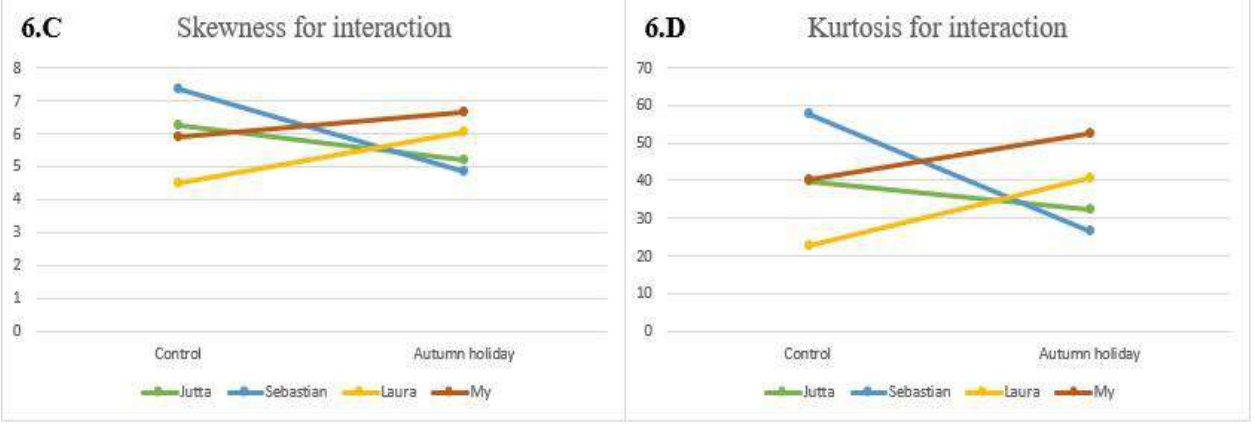

4.C
Skewness for reaction to guests/zookeepers
4
3,5
3
2,5
2
1,5
1
0,5
0
Control
Autumn holiday
Jutta
Sebastian
My


4.D
Kurtosis for reaction to guests/zookeepers
16
14
12
10
8
6
4
2
0
Control
Autumn holiday
Jutta
Sebastian
My


5.A
Medians for stereotype behaviour
Seconds
250
200
150
100
50
0
Control
Autumn holiday
Jutta
Laura
My
5.B
IQR for stereotype behaviour
Seconds
350
300
250
200
150
100
50
0
Control
Autumn holiday
Jutta
Laura
My


5.C
Skewness for stereotype behaviour
3
2,5
2
1,5
1
0,5
0
Control
Autumn holiday
Jutta
Laura
My
5.D
Kurtosis for stereotype behaviour
8
7
6
5
4
3
2
1
0
-1
-2
Control
Autum holiday
Jutta
Laura
My


6.A
Medians for Interaction
Seconds
30
25
20
15
10
5
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My
6.B
IQR for interaction
Seconds
60
50
40
30
20
10
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My


6.C
Skewness for interaction
8
7
6
5
4
3
2
1
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My
6.D
Kurtosis for interaction
70
60
50
40
30
20
10
0
Control
Autumn holiday
Jutta
Sebastian
Laura
My

Appendix H

Comparisons between the chimpanzees *Passive behaviour*

Kruskal-Wallis test for equal medians (Control)
H (chi2): 4.02
Hc (tie corrected): 4.02
p (same): 0.26
There is no significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 8.03
Hc (tie corrected): 8.03
p (same): 0.05
There is a significant difference between sample medians

Movement
Kruskal-Wallis test for equal medians (Control)
H (chi2): 8.612
Hc (tie corrected): 8.62
p (same): 0.03479
There is a significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 5.109
Hc (tie corrected): 5.114
p (same): 0.1636
There is no significant difference between sample medians

Foraging
Kruskal-Wallis test for equal medians (Control)

H (chi2): 10.39

Hc (tie corrected): 10.39

p (same): 0.01554

There is a significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 18.56

Hc (tie corrected): 18.57
p (same): 0.0003359
There is a significant difference between sample medians

Reaction to guests/zookeepers
Kruskal-Wallis test for equal medians (Control)
H (chi2): 6.275
Hc (tie corrected): 6.29
p (same): 0.09831
There is no significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 5.575
Hc (tie corrected): 5.592
p (same): 0.06104

There is no significant difference between sample medians

Stereotype behaviour
Kruskal-Wallis test for equal medians (Control)
H (chi2): 9.647
Hc (tie corrected): 9.649
p (same): 0.008032
There is a significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 11.92
Hc (tie corrected): 11.92
p (same): 0.002581
There is a significant difference between sample medians

Interaction
Kruskal-Wallis test for equal medians (Control)
H (chi2): 6.169
Hc (tie corrected): 6.174
p (same): 0.1034
There is no significant difference between sample medians

Kruskal-Wallis test for equal medians (Holiday)
H (chi2): 14.82

Hc (tie corrected): 14.84
p (same): 0.00196
There is a significant difference between sample medians

Mann-Whitney pairwise

		Control				Holiday			
		Jutta	Sebastian	Laura	My	Jutta	Sebastian	Laura	My
Passive behaviour	Jutta		n.s.	n.s.	n.s.		n.s.	n.s.	J>M*
	Sebastian	n.s.		n.s.	n.s.	n.s.		n.s.	S>M*
	Laura	n.s.	n.s.		n.s.	n.s.	n.s.		n.s.
	My	n.s.	n.s.	n.s.		J>M*	S>M*	n.s.	
Movement	Jutta		n.s.	n.s.	J<M**		n.s.	n.s.	J>M*
	Sebastian	n.s.		n.s.	n.s.	n.s.		n.s.	n.s.
	Laura	n.s.	n.s.		n.s.	n.s.	n.s.		n.s.
	My	J<M**	n.s.	n.s.		J>M*	n.s.	n.s.	
Foraging	Jutta		J>S*	n.s.	J>M**		J>S**	J>L**	J>M**
	Sebastian	J>S*		n.s.	n.s.	J>S**		n.s.	n.s.
	Laura	n.s.	n.s.		L>M*	J>L**	n.s.		n.s.
	My	J>M**	n.s.	L>M*		J>M**	n.s.	n.s.	
Reaction to guests/zookeepers	Jutta		n.s.	n.s.	J<M*		J>S*	-	n.s.
	Sebastian	n.s.		n.s.	n.s.	J>S*		-	n.s.
	Laura	n.s.	n.s.		n.s.	-	-		-
	My	J<M*	n.s.	n.s.		n.s.	n.s.	-	
Stereotype behaviour	Jutta		-	n.s.	J>M**		-	n.s.	J>M**
	Sebastian	-		-	-	-		-	-
	Laura	n.s.	-		L>M*	n.s.	-		L>M*
	My	J>M**	-	L>M*		J>M**	-	L>M*	
Interaction	Jutta		n.s.	n.s.	n.s.		n.s.	n.s.	J>M*
	Sebastian	n.s.		L>S*	n.s.	n.s.		L>S**	n.s.
	Laura	n.s.	L>S*		L>M*	n.s.	L>S**		L>M**
	My	n.s.	n.s.	L>M*		J>M*	n.s.	L>M**	

*P<0.05 **P<0.01

IQR

		Control				Holiday			
		Jutta	Sebastian	Laura	My	Jutta	Sebastian	Laura	My
Passive behaviour	Jutta		n.s.	J>L**	J>M**		J>S**	J>L**	J>M**
	Sebastian	n.s.		S>L**	S>M**	J>S**		S>L**	n.s.
	Laura	J>L**	S>L**		n.s.	J>L**	S>L**		M>L**
	My	J>M**	S>M**	n.s.		J>M**	n.s.	M>L**	
Movement	Jutta		n.s.	J>L*	M>J**		n.s.	J>L**	n.s.
	Sebastian	n.s.		S>L**	M>S**	n.s.		S>L**	n.s.
	Laura	J>L*	S>L**		M>L**	J>L**	S>L**		M>L**
	My	M>J**	M>S**	M>L**		n.s.	n.s.	M>L**	
Foraging	Jutta		n.s.	n.s.	J>M**		n.s.	J>L**	J>M**
	Sebastian	n.s.		n.s.	S>M*	n.s.		S>L**	S>M**
	Laura	n.s.	n.s.		L>M**	J>L**	S>L**		n.s.
	My	J>M**	S>M*	L>M**		J>M**	S>M**	n.s.	
Reaction to guests/zoo keepers	Jutta		S>J**	n.s.	n.s.		J>S*	-	n.s.
	Sebastian	S>J**		n.s.	n.s.	J>S*		-	n.s.
	Laura	n.s.	n.s.		n.s.	-	-		-
	My	n.s.	n.s.	n.s.		n.s.	n.s.	-	
Stereotype behaviour	Jutta		-	n.s.	J>M*		-	n.s.	J>M*
	Sebastian	-		-	-	-		-	-
	Laura	n.s.	-		L>M**	n.s.	-		n.s.
	My	J>M*	-	L>M**		J>M*	-	n.s.	
Interaction	Jutta		n.s.	n.s.	n.s.		J>S*	n.s.	n.s.
	Sebastian	n.s.		L>S**	n.s.	J>S*		L>S*	n.s.
	Laura	n.s.	L>S**		L>M**	n.s.	L>S*		n.s.
	My	n.s.	n.s.	L>M**		n.s.	n.s.	n.s.	

*P<0.05 **P<0.01

Appendix I

Summery statistics for comparisons between the chimpanzees

Passive behaviour

Control												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	161	161	161	162	162	162	220	220	220	183	183	183
Min	3			7			2			9		
Max	3651			4565			3601			3977		
Sum	28364	17157	37502	35487	20885	47506	32168	19825	42328	25315	13138	34607
Mean	176.17	106.57	232.93	219.06	128.92	293.25	146.22	90.11	192.40	138.33	71.79	189.11
Std. error	32.60	0.00	42.41	42.81	7.89	55.53	26.14	6.77	33.48	30.07	0.00	40.66
Variance	171053.50	-8664.88	289573.60	296875.20	10083.94	499532.10	150302.10	10094.62	246577.00	165491.60	-44113.87	302544.30
Stand. dev	413.59	234.91	597.97	544.86	325.74	782.78	387.69	236.39	542.94	406.81	201.16	644.98
Median	36.00	22.00	43.00	36.50	27.00	43.00	33.00	26.50	37.00	33.00	25.00	38.00
25 prcntil	20.00	15.50	23.00	20.00	15.00	23.00	19.00	17.00	21.00	19.00	17.00	21.00
75 prcntil	117.50	35.00	158.00	131.25	21.00	183.50	76.75	62.00	98.50	77.00	41.00	94.00
Skewness	5.18	3.55	7.59	4.97	3.28	6.95	5.34	3.55	7.38	6.92	4.66	10.60
Kurtosis	34.72	10.66	61.75	30.59	6.03	51.92	35.74	8.49	60.95	56.37	11.02	101.93
Geom. mean	54.89	41.85	64.98	58.33	43.94	69.46	44.12	35.66	50.89	44.82	35.92	51.99
Coeff. var	234.76	186.95	296.63	248.73	201.90	308.61	265.14	217.94	319.77	294.08	241.00	407.98
Holiday												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	151	151	151	195	195	195	256	256	256	215	215	215
Min	3			3			2			2		
Max	4342			2510			3546			3235		
Sum	31306	18546	41916	36123	23919	47001	36810	22924	48504	29397	17814	38932
Mean	207.32	122.82	277.59	185.25	122.66	241.03	143.79	89.55	189.47	136.73	82.86	181.08
Std. error	39.91	0.00	52.35	29.61	18.77	36.36	25.78	10.61	33.20	25.29	7.72	32.89
Variance	240469.60	-31010.90	413879.50	170932.80	68714.62	257734.70	170099.00	28802.59	282222.30	137508.70	12816.97	232552.50
Stand. dev	490.38	265.25	721.80	413.44	304.24	536.83	412.43	266.83	584.08	370.82	229.59	535.57
Median	47.00	24.00	61.00	40.00	30.00	46.00	34.00	30.00	38.00	29.00	23.00	35.00
25 prcntil	18.00	13.00	21.00	20.00	16.00	23.00	20.00	17.00	23.00	16.00	15.00	18.00
75 prcntil	150.00	56.00	181.00	103.00	26.00	134.00	64.75	52.25	74.00	101.00	63.00	133.00
Skewness	5.34	3.72	8.06	3.58	2.44	4.40	5.67	3.92	7.33	5.63	3.53	7.21
Kurtosis	36.91	12.27	67.49	13.46	1.77	19.82	37.09	6.30	56.87	36.04	0.24	55.03
Geom. mean	60.12	44.37	72.57	52.91	40.70	62.52	43.81	36.65	49.84	41.95	33.58	48.77
Coeff. var	236.53	185.77	301.93	223.18	194.34	252.41	286.83	246.39	352.28	271.21	231.37	334.84

Movement

Control												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	294	294	294	316	316	316	348	348	348	402	402	402
Min	1			2			1			1		
Max	155			325			138			449		
Sum	6061	5340	6737	7717	6635	8696	7124	6408	7819	10897	9366	12188
Mean	20.62	18.16	22.91	24.42	21.00	27.52	20.47	18.41	22.47	27.11	23.30	30.32
Std. error	1.23	0.94	1.43	1.67	0.75	2.07	1.05	0.84	1.21	1.80	0.73	2.22
Variance	443.66	258.36	600.79	883.50	179.95	1353.66	382.41	244.33	505.71	1303.48	212.67	1981.18
Stand. dev	21.06	17.05	25.20	29.72	19.61	39.12	19.56	16.30	23.01	36.10	23.28	47.19
Median	13.00	11.00	15.00	16.00	14.00	18.00	14.00	12.00	15.00	16.00	13.00	17.50
25 prcntil	7.00	6.00	7.00	8.00	6.00	8.75	8.00	6.00	8.00	9.00	8.00	10.00
75 prcntil	28.00	23.75	34.00	28.75	24.50	32.50	24.00	20.00	25.00	32.25	27.50	35.50
Skewness	2.64	2.00	3.60	4.87	3.60	7.72	2.69	2.17	3.28	5.58	4.16	8.70
Kurtosis	10.06	4.68	17.12	37.69	18.42	70.45	9.20	4.59	13.39	50.81	28.01	94.13
Geom. mean	13.78	12.28	15.10	15.93	14.20	17.45	14.87	13.60	16.04	16.76	15.10	18.27
Coeff. var	102.17	89.54	115.99	121.71	94.24	151.81	95.53	85.85	106.97	133.19	101.23	164.75
Holiday												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	255	255	255	392	392	392	366	366	366	450	450	450
Min	2			1			2			1		
Max	168			195			226			259		
Sum	6246	5389	7037	8979	7939	9930	8341	7262	9295	10120	8839	11240
Mean	24.49	21.13	27.60	22.91	20.25	25.33	22.79	19.84	25.40	22.49	19.64	24.98
Std. error	1.64	1.22	1.93	1.31	1.01	1.52	1.39	1.01	1.63	1.37	0.94	1.64
Variance	684.50	381.99	947.54	675.28	400.28	905.12	709.11	374.02	973.06	844.73	401.31	1206.26
Stand. dev	26.16	20.91	31.80	25.99	21.15	30.87	26.63	20.94	32.16	29.06	22.24	36.15
Median	16.00	14.00	18.00	13.00	10.50	14.00	14.00	12.00	15.00	14.00	12.00	16.00
25 prcntil	9.00	8.00	10.00	7.00	6.00	7.00	8.75	7.50	10.50	8.00	7.00	9.25
75 prcntil	29.00	24.00	32.00	29.00	25.00	32.25	25.25	22.50	28.50	27.00	24.00	30.00
Skewness	2.82	2.29	3.44	3.02	2.47	3.95	3.35	2.54	4.26	4.32	3.62	5.43
Kurtosis	9.76	4.94	13.80	12.96	8.00	20.15	15.04	5.92	23.40	24.99	14.56	35.34
Geom. mean	16.43	14.50	18.17	14.46	13.00	15.71	14.97	13.49	16.24	14.11	12.82	15.27
Coeff. var	106.81	94.63	121.89	113.45	100.36	128.40	116.85	102.53	133.03	129.24	111.66	151.76

Foraging

Control												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	96	96	96	111	111	111	90	90	90	120	120	120
Min	2			1			6			2		
Max	980			1012			740			879		
Sum	15456	11045	19466	14882	10730	18731	11532	8526	14255	13544	9552	17117
Mean	161.00	115.05	202.77	134.07	96.67	168.75	128.13	94.73	158.39	112.87	79.60	142.64
Std. error	22.30	15.90	27.12	18.85	13.15	22.77	16.49	11.85	19.83	16.13	11.53	19.39
Variance	47758.23	24284.53	70582.80	39440.12	19188.18	57527.01	24471.53	12636.04	35373.24	31233.65	15962.05	45125.17
Stand. dev	218.54	170.18	279.17	198.60	152.87	251.06	156.43	122.32	196.38	176.73	137.81	221.77
Median	69.50	36.00	88.00	44.00	25.00	56.00	58.00	25.50	73.50	34.50	21.00	43.00
25 prcntil	27.50	16.00	34.00	18.00	10.00	22.00	23.00	13.25	27.25	15.50	10.00	23.00
75 prcntil	203.25	148.50	273.50	157.00	51.00	219.00	167.00	66.50	210.25	120.75	56.50	166.00
Skewness	2.19	1.43	2.80	2.27	1.50	2.98	1.92	1.28	2.54	2.37	1.57	2.98
Kurtosis	4.31	-1.17	7.24	5.35	0.07	9.28	3.52	-0.39	6.34	5.24	-0.60	8.51
Geom. mean	71.66	49.42	89.19	47.01	30.65	58.87	63.56	45.10	77.84	40.02	27.57	49.35
Coeff. var	135.74	118.07	154.49	148.13	126.16	170.05	122.09	104.58	140.91	156.58	136.14	177.21
Holiday												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	72	72	72	93	93	93	83	83	83	119	119	119
Min	2			1			1			2		
Max	1325			937			1166			671		
Sum	15024	10765	18798	13403	9367	17078	10896	7108	14017	11752	8607	14543
Mean	208.67	149.51	261.08	144.12	100.72	183.63	131.28	85.64	168.88	98.76	72.33	122.21
Std. error	28.88	15.63	35.96	21.19	14.85	25.62	21.00	8.28	26.78	12.90	8.74	15.76
Variance	60038.90	17599.03	93079.82	41775.41	20517.10	61038.02	36596.25	5692.09	59511.52	19788.86	9099.69	29548.11
Stand. dev	245.03	169.93	325.75	204.39	157.72	258.74	191.30	122.79	265.64	140.67	106.77	181.20
Median	118.50	72.00	160.00	49.00	10.00	69.00	70.00	55.00	97.00	42.00	26.00	54.00
25 prcntil	43.75	13.00	55.50	11.50	2.00	17.00	24.00	8.00	34.00	15.00	8.00	18.00
75 prcntil	296.25	187.50	413.50	193.50	118.00	257.50	136.00	75.00	165.00	128.00	78.00	167.00
Skewness	2.23	1.39	3.26	2.04	1.38	2.64	3.02	1.94	4.34	2.56	1.91	3.15
Kurtosis	6.08	-0.19	11.51	3.95	-0.46	6.78	11.27	1.51	20.47	6.91	1.50	10.53
Geom. mean	102.36	64.21	130.75	44.51	25.25	58.21	57.22	36.74	72.33	41.68	30.06	51.13
Coeff. var	117.43	95.40	141.63	141.82	119.65	163.77	145.72	118.49	178.74	142.44	123.58	164.77

Reaction to guests/zookeepers

Control												
	Jutta (Reak.) C	Lower conf.	Upper conf.	Seb. (Reak.) C	Lower conf.	Upper conf.	Laura (Reak.) C	Lower conf.	Upper conf.	My (Reak.) C	Lower conf.	Upper conf.
N	15	15	15	8	8	8	7	7	7	14	14	14
Min	2			2			5			3		
Max	33			86			48			88		
Sum	173	95	240	213	49	346	157	71	235	396	222	538
Mean	11.53	6.33	16.00	26.63	6.13	43.25	22.43	10.14	33.57	28.29	15.86	38.43
Std. error	2.49	1.62	3.24	10.15	4.69	13.74	6.43	4.74	8.70	6.03	1.38	8.06
Variance	92.98	39.56	157.61	824.27	175.84	1510.54	289.62	157.33	530.33	508.53	26.83	910.50
Stand. dev	9.64	7.19	13.96	28.71	19.04	45.67	17.02	13.50	27.04	22.55	13.63	34.78
Median	7.00	-5.00	8.00	17.00	-7.00	29.00	21.00	0.00	35.00	24.00	13.00	33.50
25 prcntil	3.00	-1.00	4.00	5.25	-16.50	8.50	7.00	-10.00	9.00	9.75	-4.75	15.00
75 prcntil	19.00	11.00	31.00	40.50	-5.00	74.00	42.00	36.00	74.00	36.25	8.50	46.50
Skewness	1.05	-0.04	2.05	1.39	0.22	3.54	0.63	-0.84	2.41	1.51	0.64	3.43
Kurtosis	0.18	-4.59	2.03	1.87	-3.26	6.21	-1.24	-7.22	0.19	2.92	-1.34	7.38
Geom. mean	8.06	3.37	11.00	14.10	-3.92	22.10	16.66	3.23	24.22	20.31	8.75	27.95
Coeff. var	83.61	60.92	110.21	107.83	58.43	160.70	75.88	45.90	113.06	79.72	55.05	115.38
Holiday												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.			
N	7	7	7	8	8	8	27	27	27			
Min	8			2			1					
Max	116			23			114					
Sum	227	18	374	59	19	86	493	243	678			
Mean	32.43	2.57	53.43	7.38	2.38	10.75	18.26	9.00	25.11			
Std. error	14.88	4.70	20.98	2.38	0.00	3.32	4.22	0.00	5.72			
Variance	1549.29	154.57	3082.57	45.13	-2.82	88.32	479.97	-197.63	881.91			
Stand. dev	39.36	24.46	74.72	6.72	3.79	12.05	21.91	9.79	34.98			
Median	15.00	-18.00	22.00	4.50	0.00	5.00	14.00	8.00	21.00			
25 prcntil	8.00	-4.00	8.00	4.00	3.00	6.00	6.00	3.00	10.00			
75 prcntil	48.00	-20.00	84.00	8.75	-5.50	13.50	25.00	20.00	35.00			
Skewness	2.08	1.53	4.51	2.22	1.72	5.11	3.40	2.87	6.69			
Kurtosis	4.29	1.68	11.36	5.35	3.13	13.13	14.44	10.92	30.35			
Geom. mean	20.01	-1.21	29.16	5.66	1.89	7.66	10.92	5.58	14.54			
Coeff. var	121.38	89.63	212.46	91.08	69.25	151.76	119.98	88.39	179.35			

Stereotype behaviour

Control									
	Jutta	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	9	9	9	13	13	13	9	9	9
Min	12			13			26		
Max	696			415			85		
Sum	2489	1278	3563	1987	1065	2806	436	313	553
Mean	276.56	142.00	395.89	152.85	81.92	215.85	48.44	34.78	61.44
Std. error	69.63	34.57	94.20	35.58	24.54	46.30	7.44	5.56	9.65
Variance	43639.53	10754.53	79862.19	16453.97	7830.64	27867.36	497.78	278.28	837.61
Stand. dev	208.90	141.17	331.68	128.27	98.19	185.55	22.31	17.84	32.05
Median	213.00	-23.00	294.00	118.00	-30.00	183.00	39.00	6.00	52.00
25 prcntil	135.00	54.50	258.00	47.00	-17.00	70.50	26.50	6.50	27.00
75 prcntil	433.50	171.00	654.00	271.00	169.00	424.00	70.00	55.00	101.00
Skewness	1.00	-0.22	2.62	0.90	-0.32	1.99	0.51	-0.99	1.82
Kurtosis	0.78	-4.37	3.71	-0.34	-5.72	1.19	-1.35	-7.37	-0.39
Geom. mean	186.79	27.60	288.53	102.48	33.59	145.43	44.01	29.64	54.72
Coeff. var	75.54	45.65	110.08	83.92	57.20	111.97	46.05	35.94	64.36
Holiday									
	Jutta	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	12	12	12	12	12	12	7	7	7
Min	40			11			10		
Max	587			626			79		
Sum	2840	1612	3950	1723	445	2611	258	131	369
Mean	236.67	134.33	329.17	143.58	37.08	217.58	36.86	18.71	52.71
Std. error	51.83	36.06	66.67	48.77	0.00	67.77	9.18	5.23	12.48
Variance	32234.24	15608.15	53344.79	28537.36	-7397.92	55118.33	589.81	191.71	1089.81
Stand. dev	179.54	138.03	253.61	168.93	83.95	293.63	24.29	17.14	39.10
Median	183.50	-39.00	276.50	94.00	19.50	142.50	30.00	3.00	46.00
25 prcntil	89.75	18.50	131.00	39.25	-15.25	66.25	14.00	-11.00	18.00
75 prcntil	411.00	272.50	620.00	189.75	-154.75	282.50	57.00	35.00	85.00
Skewness	0.75	-0.53	1.89	2.43	1.73	4.95	0.83	-0.37	2.62
Kurtosis	-0.72	-5.51	0.67	6.64	2.96	14.98	0.12	-4.40	2.85
Geom. mean	174.90	73.06	240.04	83.75	11.11	122.40	29.91	10.71	41.71
Coeff. var	75.86	53.49	102.44	117.65	83.52	182.61	65.89	41.78	101.73

Interaction

Control												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	42	42	42	70	70	70	39	39	39	63	63	63
Min	2			3			3			2		
Max	1114			626			1114			499		
Sum	2170	-150	3502	2183	769	3045	3223	456	5077	2138	932	2935
Mean	51.67	-3.57	83.38	31.19	10.99	43.50	82.64	11.69	130.18	33.94	14.79	46.59
Std. error	26.22	0.00	36.98	9.02	0.00	12.63	30.95	0.00	43.38	8.34	0.00	11.48
Variance	28869.15	-23740.06	57450.72	5695.37	-4355.01	11161.73	37369.13	-19629.12	73387.74	4379.93	-2535.05	8306.80
Stand. dev	169.91	54.37	322.86	75.47	25.45	135.80	193.31	79.43	349.87	66.18	26.08	111.08
Median	18.50	13.00	25.00	16.00	12.00	20.00	26.00	8.00	33.00	19.00	12.00	25.00
25 prcntil	8.75	3.25	12.50	9.00	6.00	11.00	11.00	0.00	13.00	7.00	1.00	10.00
75 prcntil	33.25	13.50	44.50	27.25	18.25	33.50	58.00	17.00	79.00	29.00	-1.00	32.00
Skewness	6.25	6.12	11.30	7.34	6.83	13.14	4.52	3.18	7.04	5.89	5.07	10.29
Kurtosis	39.92	38.70	78.99	57.94	51.77	113.58	22.47	9.45	41.73	40.41	31.30	79.14
Geom. mean	18.68	11.08	23.96	16.80	12.84	19.97	29.64	14.52	39.21	16.72	11.32	20.80
Coeff. var	328.86	288.59	579.32	241.99	200.96	407.84	233.92	179.95	366.76	195.01	151.20	297.93
Holiday												
	Jutta	Lower conf.	Upper conf.	Sebastian	Lower conf.	Upper conf.	Laura	Lower conf.	Upper conf.	My	Lower conf.	Upper conf.
N	64	64	64	71	71	71	58	58	58	108	108	108
Min	1			1			1			1		
Max	1472			690			1788			1788		
Sum	5469	1763	8124	2923	1035	4322	5119	870	7850	6568	1846	9962
Mean	85.45	27.55	126.94	41.17	14.58	60.87	88.26	15.00	135.34	60.81	17.09	92.24
Std. error	25.94	0.00	35.54	12.08	0.00	16.68	32.42	0.00	45.18	19.32	0.00	26.43
Variance	43052.85	-19293.27	80825.46	10362.66	-3241.79	19763.72	60976.27	-39240.86	118373.90	40331.16	-19750.01	75443.70
Stand. dev	207.49	90.33	342.32	101.80	48.78	172.58	246.93	92.38	434.05	200.83	84.77	329.41
Median	16.50	6.00	21.00	12.00	7.00	17.00	25.50	11.50	33.50	10.00	6.50	12.00
25 prcntil	7.25	3.25	9.50	5.00	3.00	7.00	9.75	3.00	13.50	4.00	2.00	5.00
75 prcntil	57.50	-77.75	87.25	33.00	22.00	47.00	57.75	7.50	72.50	24.00	6.00	30.00
Skewness	5.21	4.03	8.57	4.87	2.67	7.14	6.06	5.16	10.05	6.65	4.95	10.29
Kurtosis	32.41	19.03	62.39	26.49	-1.98	46.12	40.86	30.76	78.13	52.62	27.99	96.73
Geom. mean	21.38	10.75	28.24	12.76	7.88	16.26	25.03	13.04	32.90	12.00	7.64	14.96
Coeff. var	242.81	181.84	341.83	247.27	195.84	358.05	279.78	217.61	429.53	330.23	247.87	450.10

Appendix J

Behavioural shifts

			Sebastian		Laura		My	
			Chi2	P	Chi2	P	Chi2	P
Control	Jutta		9.83	0.080	10.18	0.071	3.62	0.61
	Sebastian				23.55	0.00027**	5.44	0.37
	Laura						16.69	0.0051**
	My							
Holiday	Jutta		11.15	0.049*	14.83	0.011*	12.17	0.033*
	Sebastian				17.15	0.0042**	11.32	0.045*
	Laura						41.67	6.88*10^-8**
	My							

*P<0.05

**P<0.0