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"Dominance/subordination, endocrine expression in heterosexual couples "

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Abstract

This study assessed dominance within couples using self-report questionnaires and hormone measures to examine the effects of dominance characteristics on the relationship linked to individual hormone secretion in 20 student couples (mean age of men= 29.70, SD=8.16, mean age of women=26.70, SD=4.75) recruited from the University of Vienna. In both sexes, the expression rate of the adrenal gland hormone cortisol was analyzed as a physiological stress marker as well as testosterone as physiological dominance marker.

The results showed that the majority of the participants rated their relationship as weak dominant. However, there was no agreement between the partners who in the relationship is dominant over the other, which is characterized by no significant sex differences between females and males in their dominance reports. In addition, males showed increased cortisol levels in relation to their self-reports of being more dominant than their partner. Although, no significant relationships between testosterone and questions in the questionnaire was found in males as well as, no relationships between female hormone responses and levels of dominance has been observed. Our study provides new information about the dominance strategies in romantic couples and an important step towards understanding the behavioral and physiological effects of being dominant or subordinate in a dyadic relationship.

Zusammenfassung

In dieser Studie wurde das Dominanzverhalten von Paaren mithilfe von Fragebögen und endokrinologischen Messungen analysiert, um den Einfluss von Dominanzmerkmalen auf Beziehungen zu analysieren.

Die Arbeit wurde an 20 studierenden Paaren der Universität Wien durchgeführt (mittleres Alter der Männer = 29.70, SD=8.16, mittleres Alter der Frauen = 26.70, SD=4.75). Bei beiden Geschlechtern wurde das Nebennierenrindenhormone Kortisol, als physiologischer Stressmarker und Testosteron als physiologischer Dominanzmarker analysiert.

Die Ergebnisse zeigen, dass die Mehrheit der Teilnehmer ihre Beziehung als schwach dominant definierte. Darüber hinaus gab es bei den Paaren keine Einigung zwischen den beiden Partnern wer dominant ist. Letzteres spiegelt sich darin wider, dass in männlichen und weiblichen Dominanzberichten keine signifikanten Geschlechtsunterschiede zwischen Frauen und Männern feststellar sind. Bei Männern korrelieren erhöhte Kortisolspiegel mit deren Dominanz. Bei Frauen Beziehung wurden keine Zusammenhänge zwischen den beantworteten Fragen beziehungsweise Dominanzniveau und Hormonreaktionen beobachtet. Unsere Studie liefert neue Informationen über die Dominanzstrategien bei romantischen Paaren und einen wichtigen Schritt zum Verständnis der verhaltensbezogenen und physiologischen Auswirkungen einer Dominanz oder Unterordnung in einer dyadischen Beziehung.

1. Introduction

Within human groups across cultures and in nonhuman primates, social hierarchies emerge in individuals relative to others (Dickerson & Kemeny, 2004). In hierarchical relationships, distinct positions or ranks help to define clear roles in terms of who outrank whom (Hinde, 1978; Oyamot et al., 2010). Humans organize their social groups in hierarchies called the socio-economic status (SES), which is defined by education, job position, and earning. Therefore, individuals of high SES have more power and influence to acquire valued resources than those of lower SES (Dickerson & Kemeny, 2004; Ponzi et al., 2015). In evolutionary terms, social hierarchies are considered to have adaptive advantages in helping to reduce the costs of individuals when there is a conflict over resources or disagreement about a course of action (Smith & Price, 1973; Ponzi et al., 2015). Regarding to this, following question may raise for egalitarian societies: if social hierarchy is an adaptive strategy to reduce conflicts and enhance cooperation within a community, why have egalitarian societies evolved? Boehm (1999) addressed this question by examining the evolutionary origins of egalitarianism. He argues that among Paleolithic hunter-gatherers subordinates must have developed egalitarian traits and a moral community to take charge and prevent high-rankings from developing any serious degree of authority. These can readily lead to an egalitarian transition. Thus, he determines that egalitarianism is a product from a very special type of hierarchy that involves insightful guidance and manipulation.

Studies of evolutionary predictions in human behavior, such as social hierarchy, show that SES is associated with reproduction in socially living mammals including humans (Jozifkova & Konvicka, 2009; Fieder et al., 2005). Accordingly, females are expected to choose males of high SES as a mating strategy since a male`s high status signalizes high quality of genes, greater protection to severe threats, and easier access to scarce resources. In industrialized societies, the SES became a robust factor indicating one´s social rank and represents the most frequently studied factor on the effects of status (Dunbar, 2004; Adams, 1965; Siart et al., 2016). In a recent study, Fieder et al. (2005) found a positive association between high social status and reproductive success in humans. Similarly, Jozifkova and Kolackova (2017) revealed that dominant men had enhanced reproductive success as well as increased physical attractiveness. Therefore, high SES individuals

are also expected to have some evolutionary advantages such as increased reproductive success (Fieder & Huber, 2007; Jozifkova & Kolackova, 2017).

However, marital and dating literature suggests that the experience of inequity in a relationship to SES is associated with negative psychological and relationship outcomes whereas partners who see themselves socially equal are more satisfied in their relationship (Aida & Falbo, 1991; Bentley et al., 2007; Gray-Little & Burks, 1983). In line with this prediction, Ponzi et al. (2015) found in individuals of egalitarian relationships argued significantly less and shared decision-making more often than individuals with strong or weak dominance relationships did. However, as mentioned before, in the light of the evolutionary theory in-pair hierarchy may have advantages. Mating a high-ranking individual allows a low-ranking one to increase its own fitness by advancing in the social hierarchy. Hierarchy within partners can also offer individuals to avoid challenges and conflicts that may occur due to unpredictability of social roles so that partners can cooperate easily. Accordingly, Jozifkova et al. (2014) showed that partners with a hierarchic disparity have higher reproductive success than equally ranking pairs. Furthermore, a study by Stevanovic et al. (2019) tested "interpersonal theory" that proposes oppositeness as so called complementary in dyadic interactions (i.e. dominance versus submissiveness) increase level of happiness and reduce anxiety, whereas similarity in dominance leads to increased anxiety. Their results yield that both female and male exhibited the same complementary patterns where dominance has been demonstrated with regard to submissiveness and *vice versa*. Likewise, "dyadic power theory" claimed that in equal relationships partners display more dominance as a way to deal with conflict and assert themselves. In contrast, those in unequal positions display less dominance because it has already established who controls the interaction and who contributes less to decision making (Dunbar & Abra, 2010).

Another research question raised by many studies is whether the sex of individuals has a significant impact on the dominance strategies among couples (Fablo & Peplau, 1980). The most consistent results in the majority of the studies is that the male partner is more likely to be perceived dominant than women (Ponzi et al. 2015; Gray-Little & Burks, 1983). To test proximate causes of sex differences in dominance hierarchy a great deal of literature utilized evolutionary theory predicting that different hierarchical mechanisms should have resulted from diverse roles of females and males in reproduction (Luxen, 2005; Mast, 2002; Fieder & Huber, 2012). With respect to reproductive physiology, males have the capacity to maximize the reproductive outputs, whereas

females are limited by the capacity of their body to produce offspring (Boehm, 1999; Jozifkova et al., 2014). On the theoretical background males seemed to be intra-sexually competitive to have access to females to be reproductively successful than females. On the other hand females display also intra-sexual competition behavior to find the "right" reproductive partner, but may tend to facilitate affiliative behaviors to others to increase their offspring's survival by avoiding physical or social stressors (Taylor et al., 2000; Wallner et al., 2019). Evolutionary processes led to differences in body size of females and males, which may account for the sex differences in hierarchical strategies. Since males are stronger, cultural tradition makes them stereotypically more dominant (Boehm C., 1999). A further plausible cause for the sex differences in dominance may be the impact of hormonal influences. Such an endocrinological perspective implies that sex differences are rooted ultimately in differences between female´s and male´s level of circulating steroid hormones. It is well known that males produce testosterone, a biological marker of dominance behavior, in much larger quantities than in females (Maner et al. 2008; Liening S. H., & Josephs R. A., 2010). This could explain that males are expected to display more behavioral aspects of dominance. Nevertheless, some of the previous studies found no significant difference between males and females in perceived dominance (Sprecher S., 1985). These results are explained by addressing blurred socialized gender roles. Accordingly, it has been argued that both, females and males start to have equal access to educational and economic resources and thereby they became more similar in decision-making authority (Harris & Firestone, 1998). For example, Bentley et al. (2007) proposed that asymmetries in decision-making power authority found in previous empirical studies might result from patriarchal structure or traditional sex roles that ascribe women to submissive positions, while higher status and greater power have been attributed to men. However, in contrast, Luxen (2005) found an evidence that in an extremely egalitarian culture within highly educated men and women, there were sex differences in dominance. Males showed more dominance behaviors, whereas females showed more affiliative behaviors. The discrepancies between findings might be explained by considering methodological differences using behavioral observations and self-reports, but possibly most important differences in genetics between the sexes. It seems likely that despite to the cultural influence, in the evolutionary past females and males developed different behavioral tendencies caused by biological factors regarding to dominance hierarchies.

Empirical studies examining the relationship between rank and physiology in non-human primates propose that psychological stressors or threats to individual social position can activate an array of endocrine responses (Dickerson & Kemeny, 2004; Sapolsky, 2005). Thus, dominance rank within a social group can potentially influence the quality of an animal's life. For non-human primates, it has been indicated that stress responses can lead to increased activity of the hypothalamic-pituitary–adrenal axis resulting in elevated cortisol secretion rates paralleled by a rapid suppression of testosterone concentrations (Virgin & Sapolsky, 1997; Sapolsky, 2005). In dyadic relationships, subordinate individuals consistently have higher levels of HPA activation and therefore, increased cortisol titers in relation to more frequent submissive behavior compared to higher rank individuals (Dickerson & Kemeny, 2004). Similarly, there have been several empirical studies that examined the effects of psychological stressors on cortisol activation in humans (Hasegawa et al., 2008; Dickerson & Kemeny, 2004). Consistent with previous data from animal research it has been suggested that negative social interactions can trigger the activity of the HPA axis and affect individual`s physiological system (Campbell et al., 2019). For example, two studies found evidence that acute stressors can elicit cortisol activation. (Dickerson and Kemery, 2004; Jaeschke et al., 2016). Furthermore, human literature on dominance can also offer various findings in extent to whether there is a reciprocity of effect between testosterone level and dominance behavior. For example, Mazur et al. (1998) revealed that there is a correlation between rising testosterone level and dominant behavior in men. Consistently, Grant and France (2001) have shown in women that higher testosterone levels were associated with higher dominance scores.

Although considerable interest has focused on psychological and relationship consequences of dominance in couples, there is a great lack of information about the association between dominance/subordination and its biological mechanisms in humans. However, comparative data from nonhuman primates and humans on couple dominance could provide new insights about the relationships between men and women. In the present study, dominance has been operationalized as a decision-making power. The first aim of this study was to examine the effects of couple´s dominance characteristic on relationship functioning. Related to this aim, we hypothesized that dominance hierarchy should have some adaptive advantages to reduce conflicts and enhance cooperation within couples and therefore the majority of the couples would report having either strong or weak dominance in their current relationship. Similar to this hypothesis, we predict that the frequency of positive joint activities, emotional and physical intimacy should be highest in

couples characterized by strong dominance, intermediate in couples with weak dominance, and lowest in couples without clear dominance. The second aim was to assess whether there is an agreement within couples who is dominant and who is subordinate, and whether males or females are more likely to be perceived as dominant. A third aim of this study was to investigate the effects of dominance/subordination on individual hormone secretion patterns. We predict that dominance in a relationship should be related to increased testosterone levels, whereas subordination should be associated with higher concentrations of cortisol at the individual level irrespectively of sex. To test these hypotheses, we assessed dominance within couples with a single-item self-report questionnaire that asked study participants, which one of them is more dominant in their current relationship. We also administered a multi-item questionnaire assessing symmetries/asymmetries in decision-making power in many different domains of their relationship (Ponzi D. et al., 2015; Wallner B., 2019).

2. Methods

This study was part of a larger project in cooperation with University of Chicago aiming to examine the psychological, physiological, and health consequences of dominance and subordination in married couples. The ethic committee of University of Vienna approved the study (# 00414).

Study participants were 20 heterosexual couples (mean age of men= 29.70, SD=8.16, mean age of women=26.70, SD=4.75). The majority of the participants were graduate students at University of Vienna. They were recruited via fliers posted on the campus.

2.1. Questionnaires

Participants completed a single-item self-report questionnaire, the Couple Dominance Assessment (CDA) to assess dominance within couples. The questionnaire asked directly "In your current romantic relationship which of you is more dominant?" Answers were given on a 1-5 Likert scale (1= I am definitely dominant to my partner, 2= I am somewhat dominant; 3= neither one of us is dominant; 4= my partner is somewhat dominant, and 5= my partner is definitely is dominant). Subsequently, participants` age and the length of their relationship were asked.

In addition to a direct assessment of couple dominance, participants also asked to fill out a 40 items Couple Dominance Questionnaire (CDQ) to characterize symmetries/asymmetries (decision-making power) in their relationship as well as the level of argument. CDQ contained items about various aspects of participants´ relationship asking whether they or their partner have more power that is decisional about given issues. (1= we always do as I prefer, 3= we sometimes follow my preference/sometimes his/hers, 5= we always do as my partner prefer). For each 40 item, we also asked participants to report how often they and their partner argue using as well a 5-point Likert-scale for responses ranging from 1= all the time to 5= never (Ponzi et al., 2015).

2.2. Endocrine measurement

Saliva samples for testosterone (T) and cortisol (C) analyses were collected using commercial available ultrapure polypropylene tubes (IBL International GMBH, Hamburg, Germany). Participants were asked to provide 3 morning samples consisting at least 1 ml saliva into the Salicap with the help of a polypropylene straw. The saliva samples were released across 3

days between 8 and 10 am. Following collection, they were stored at -20° C until the shipment to the department of Behavioral Biology for assay. T was analyzed using the RE52631 and C the RE52611 kits.

2.3. Statistical analyses

We evaluated the interdependence of partners´ responses regarding the measurement of dominance with CDA. Given the small sample size and ordinal structure of the data, we performed Spearman's correlation coefficient, a nonparametric test, to examine the similarity of partners´ rating of dominance. We used Mann Whitney U test to examine whether females or males are more likely to be dominant in their relationship.

The CDQ data representing symmetries/asymmetries in decision-making power within couples were analyzed with factorial analysis applying Varimax rotation and Kaiser normalization. We performed Spearman correlations to assess whether participants´ CDA score correlated with their mean scores in CDQ factors. We also performed a Kruskal Wallis test to assess whether there is a difference between females and males in answered CDQ questions.

Spearman´s correlation coefficient was also performed to evaluate the relation between hormone patterns and assessment of dominance.

All statistical analyses conducted using SPSS.

3. Results

Only 3 out of 40 study participants who answered CDA reported rated their partner or themselves as dominant in the relationship. (1 or 5 score, strong dominance), 23 of them reported that they or their partner were somewhat dominant (2 or 4 score, weak dominance), and 14 of them reported that neither they nor their partners were dominant (score 3, egalitarian).

Among the 20 couples, a marginally non-significant correlation was detected in the CDA ratings between partners (r= -0.43, p= 0.054; 95% CI [-0.79, 0.43]; Figure 1).

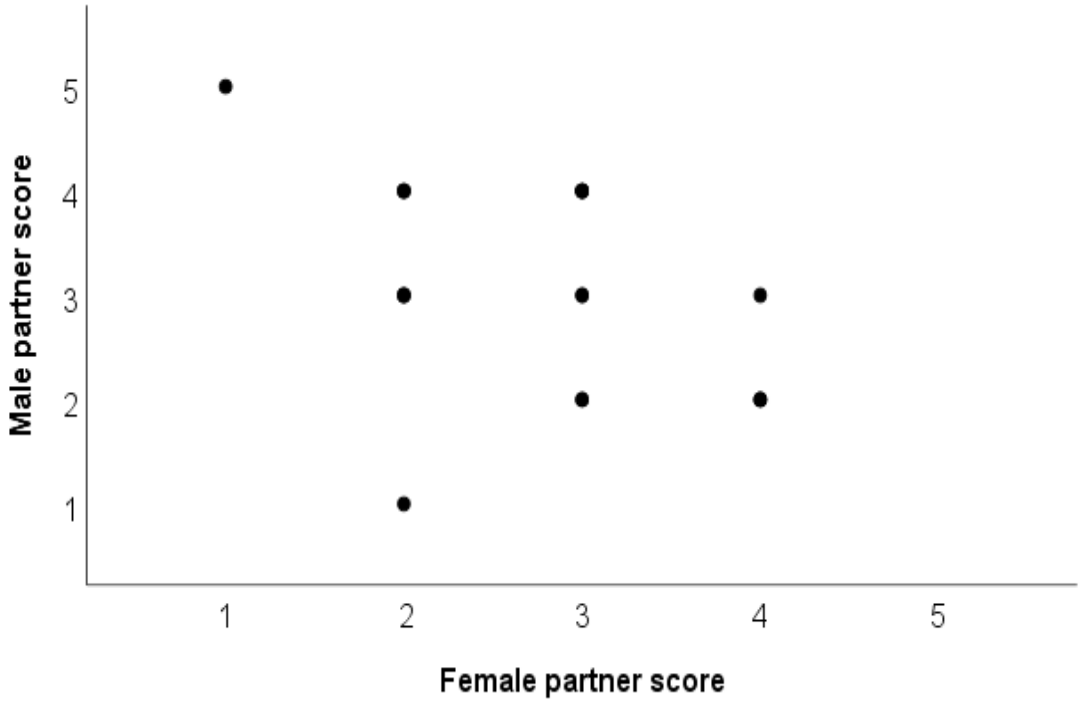

Figure 1: Correlation between male and female partner's Couple Dominance Assessment (CDA) scores.

A Mann-Whitney U test showed that there was no significant sex difference between men and women in reporting dominance (*Z= -1.16, p= 0.27*), with a mean rank 22, 55 for men and 18, 4 for women (Figure 2).

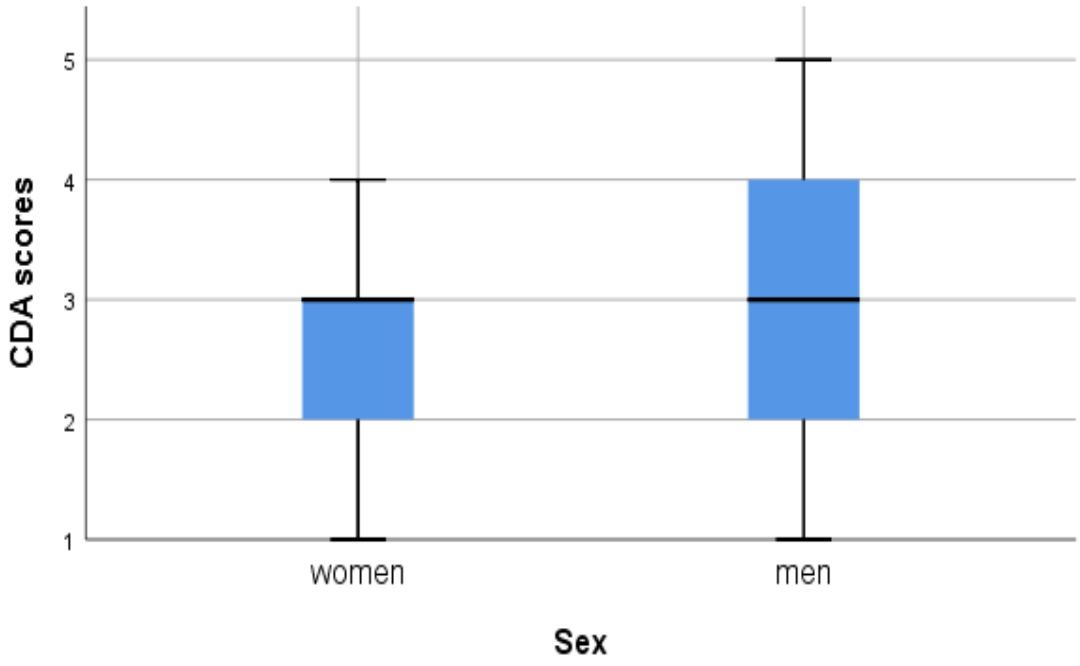

Figure 2: Sex differences between Couple Dominance Assessment (CDA) scores. Values of box plots are 25, 50, 75 percentiles.

A factor analysis with Varimax rotation and Kaiser normalization identified five factors encompassing 50 items of the 80 items in CDQ questionnaire. Items 71 and 72 were eliminated before conducting factor analysis due to having particularly high rates of missing values. These items were detected by using Missing Value Analysis to see the patterns of missing values in the data set. To suppress cross loadings within the components, absolute value defined as 0.50 for the factor analysis. The first factor was composed of 26 items (items 18, 26, 2, 38, 68, 74, 16, 54, 56, 70, 66, 48, 24, 22, 4, 28, 64, 30, 58, 12, 40, 6, 32, 20, 14; these items were mainly related to the level of arguments), the second factor had 9 items (items 29, 75, 13, 39, 51, 11, 17, 67, 1), the third factor was composed 6 items (items 69, 35, 31,59,15,43), the fourth factor had 3 items (items 19, 34, 57) and fifth factor included 5 items, (items 55, 47, 5, 53) (Table 1). The other items were not included in to five factors identified by the factor analysis, see Table 2.

Table 1: CDQ factors

Factor	Item	Loadings
Factor 1	18.We argue about spending time with friends	0.75
	26.We argue about which show or movie to watch	0.75
	2. We argue about what we spend money on	0.74
	38. We argue about how early we leave for an event	0.74
	68. We argue about how often we have sex	0.74
	74. We argue about what we do for fun	0.72
	16.We argue about what to eat	0.70
	54. We argue about doing things together rather than separately	0.69
	56. We argue about where we go out	0.67
	70. We argue about which events we go to	0.65
	66. We argue about how we spend weekends	0.64
	48. We argue about going out to places	0.63
	24.We argue about displaying affection in public	0.63
	22.We argue about making purchases	0.62
	4. We argue about whether I pay for things	0.61
	28.We argue about meeting my family	0.58
	64. We argue how much time we spend together	0.57
	30.We argue about engaging in sexual acts	0.56
	58. We argue about my future career plans	0.56
	12. We argue about sharing our emotions	0.55
	40. We argue about discussing our feelings	0.54
	6. We argue about what to play	0.54
	32. We argue about where we go out to eat	0.52
	20.We argue about the seriousness of our relationship	0.51
	14. We argue who is to blame	0.51
Factor 2	29.When my partner and I engage in sexual acts, we	0.81
	75. I talk about the attractiveness of other men/women	0.76
	13. The person who is blamed for an argument is	-0.74
	39. My partner and I discuss our feelings	0.71
	51. I give attention to other men/women	0.64
	11. My partner and I share our emotions	0.56
	17.My partner and I spend time with friends	0.52
	67. My partner and I have sex	0.51
	1.My partner and I spend money on:	0.51
Factor 3	69. When my partner and I go to an event, we	0.76
	35. When my partner and I spend money on something, we	0.69
	31.When my partner and I go out to eat, we	0.55
	59. When we´re together, I clean for my partner and me	-0.55
	15.When deciding what to eat, we	0.53
	43. In terms of clothing, my partner wears	0.50
Factor 4	19.In terms of how serious our relationship is	0.65
	34. We argue about my partner calling me	0.63
	57. As of now, my future career plans are	-0.58

Factor 5	55. When my partner and I go out, we	0.70
	47. My partner and I go out to places	0.63
	5. When we play games, we	0.60
	53. My partner and I do things together rather than separately	0.57
	27. My partner meets with my family	0.56
	61. My partner and I complete work together	0.57

Table 2: Items excluded

3. In our relationship, I pay for things
7.When we spend time with friends, we
8. We argue about whose friends to spend time with
9.My partner and I hug, kiss, or touch
10.We argue about hugging, kissing, or touching
21.My partner and I purchase
23.My partner and I display affection in public
25.When we watch a TV show or a movie, we
26.We argue about which show or movie to watch
33.My partner calls me
36.We argue about how much money to spend on something
37.When my partner and I go to an event, we leave
41.When we listen to music, my partner and I
42. We argue about what music to listen to
44. We argue about what my partner wears
45.When we´re together, I cook for my partner and me
46.We argue about how often I cook for us
49. My partner talks to me
50. We argue about how much my partner talks to me
52. We argue about the level of attention I give to other men/women
60. We argue about how often I clean
62. We argue how often we complete work together
63. My partner and I spend time together
65. My partner and I spend weekends
71. I have sex with other men/women
72. We argue about the amount of sex I have with other men/women
73. My partner and I do for fun
76. We argue about how much I talk about the attractiveness of other men/women
77. I talk to ex-girlfriends/boyfriends/spouses
78. We argue about how much I talk to ex-girlfriends/boyfriends/spouses
79. I share information about our relationship with others
80. We argue about how much information I share with others about our relationship

To evaluate whether the assessment of dominance with the CDA reliably reflect asymmetries in decision-making power in many aspect of the relationship, bivariate correlations between the mean values of CDQ factors and CDA scores were tested. Spearman correlations were

not significant for Factor 1 (r= -0.95, p= 0.56), Factor 2 (r= 0.29, p= 0.69), Factor 3 (r= 0.28, p=0.80), Factor 4 (r= 0.14, p= 0.36), nor Factor 5 (r= 0.26, p= 0.10), see Table 3.

Table 3: Correlations between the mean (± SD) scores of CDA and the scores of the four CDQ factors indicating dominance in decision-making.

Correlations

	CDA scores	Arguing	Emotion and partner issues	Chilling	Existential issues	Socializing
CDA scores	1,000					
Arguing	-,095	1,000				
Emotion and partner issues	0,290	0,004	1,000			
Chilling	0,280	-0,132	0,035	1,000		
Existential issues	0,148	0,085	-0,075	0,096	1,000	-0,017
Socializing	0,263	0,047	0,029	0,221	-0,017	1,000

The associations between CDQ five factors and CDA scores of couples represented Figure 3, 4, 5, 6, 7 respectively below.

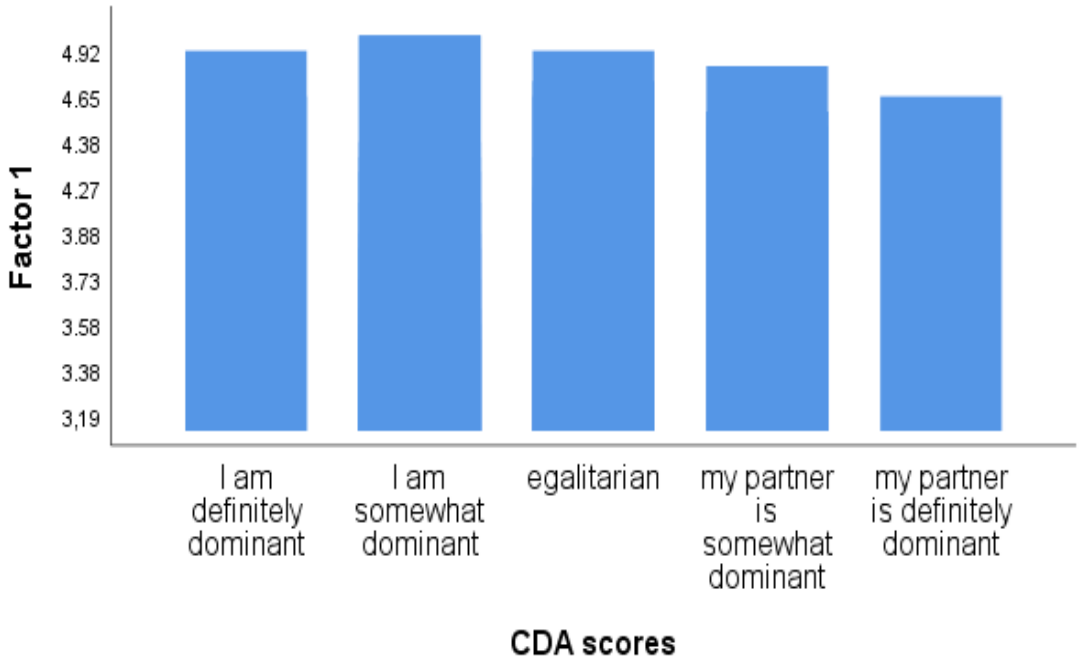

Figure 3. The association between mean CDQ scores indicating the level of argument within couples and Couple Dominance Assessment (CDA) scores. Higher scores reveals lower level of argument.

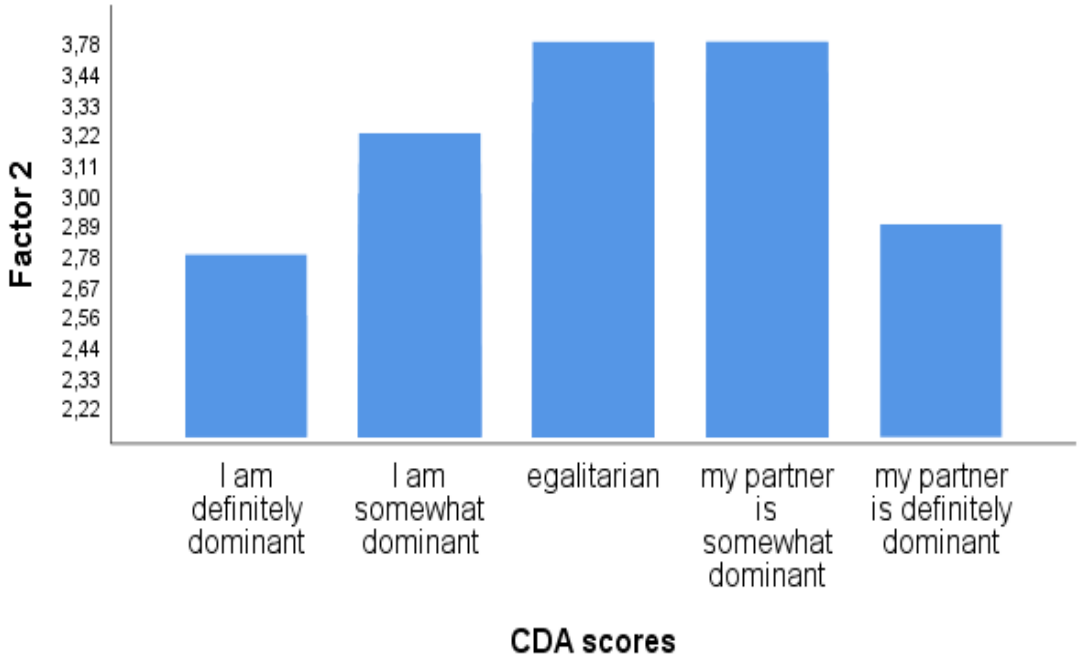

Figure 4. The association between mean CDQ scores indicating emotion and partner issues within couples and Couple Dominance Assessment (CDA) scores.

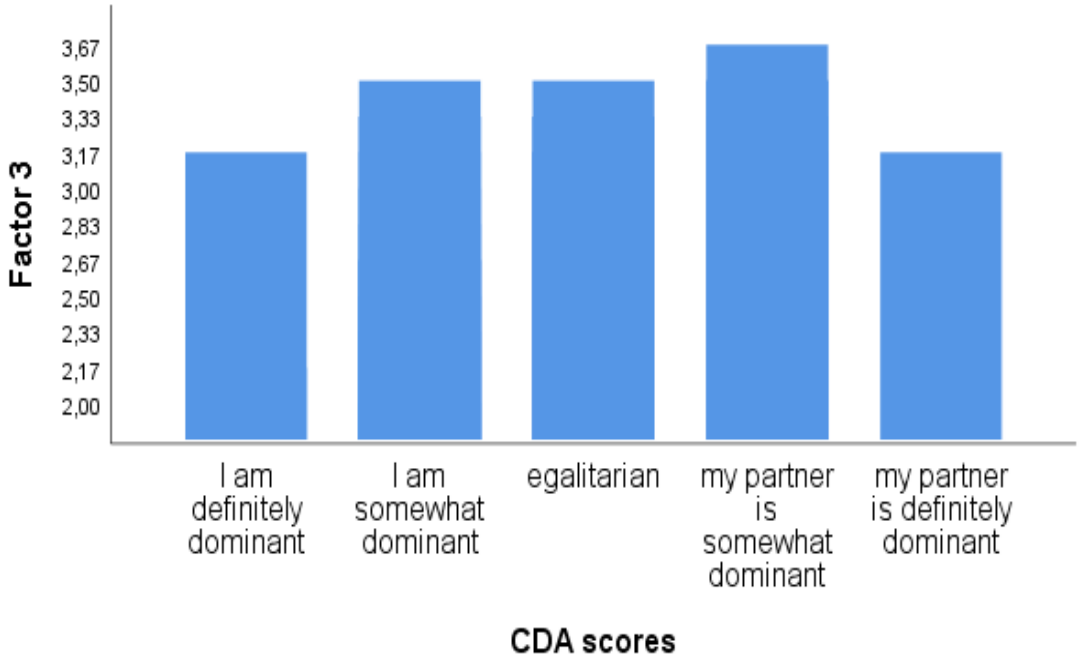

Figure 5: The association between mean CDQ scores indicating chilling within couples and Couple Dominance Assessment (CDA) scores.

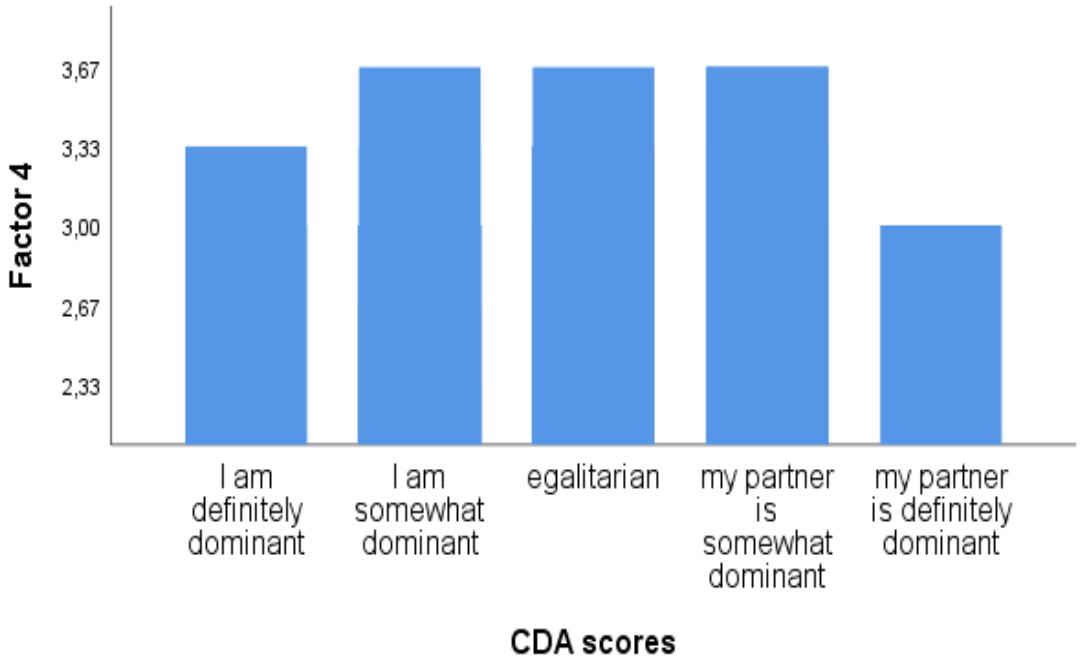

Figure 6: The association between mean CDQ scores indicating existential issues within couples and Couple Dominance Assessment (CDA) scores.

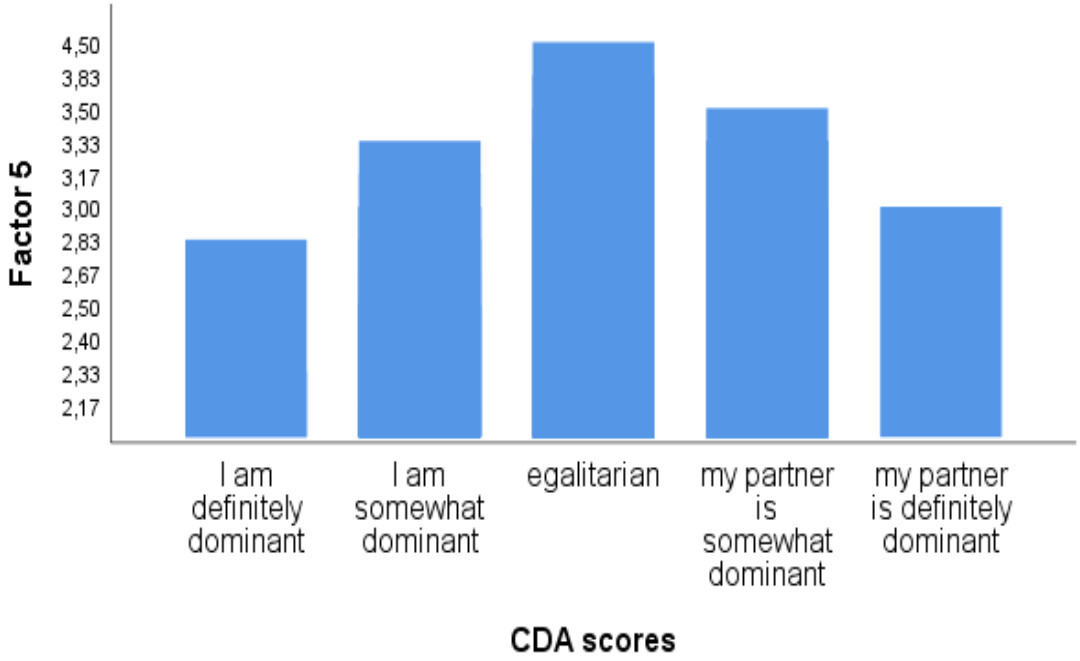

Figure 7: The association between mean CDQ scores indicating socializing within couples and Couple Dominance Assessment (CDA) scores.

Table 4: Descriptive statistics indicating means and standard deviations of five CDQ factors and CDA scores.

	Mean	Standard deviation
Factor 1	4,11	0,52
Factor 2	2,93	0,39
Factor 3	2,97	0,39
Factor 4	3,07	0,35
Factor 5	2,96	0,43
CDA scores	2,93	0,94

A Kruskal Wallis test showed that given responses of females and males to the CDQ questions differed significantly only in Factor 3 representing the aspects of chilling in their relationship. No differences have been found for the Factor 1, 2, 4, and 5 (Table 4).

Comparisons of females' and males' responses to the CDQ questions classified by five factors were represented below.

Table 5: Comparisons of given responses to the five factors between females and males.

	Arguing	Emotion and partner issues	Chilling	Existential issues	Socializing
Kruskal-Wallis H	0,279	2,489	8,775	0,676	1,114
df	1	1	1	1	1
Asymp. Sig.	0,598	0,115	0,003	0,411	0,291

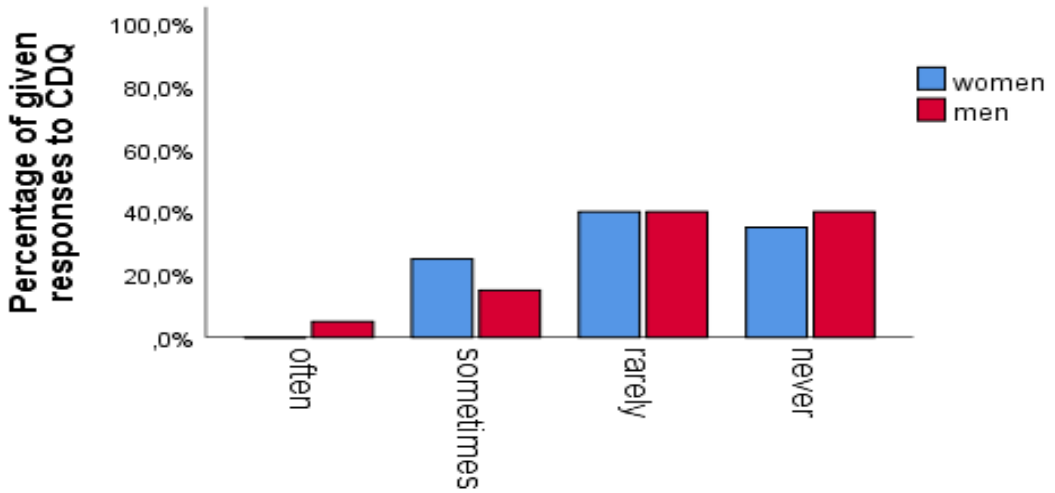

Figure 8: It shows the percentage sexual differences in arguing about spending time with friends. No statistical differences are detectable.

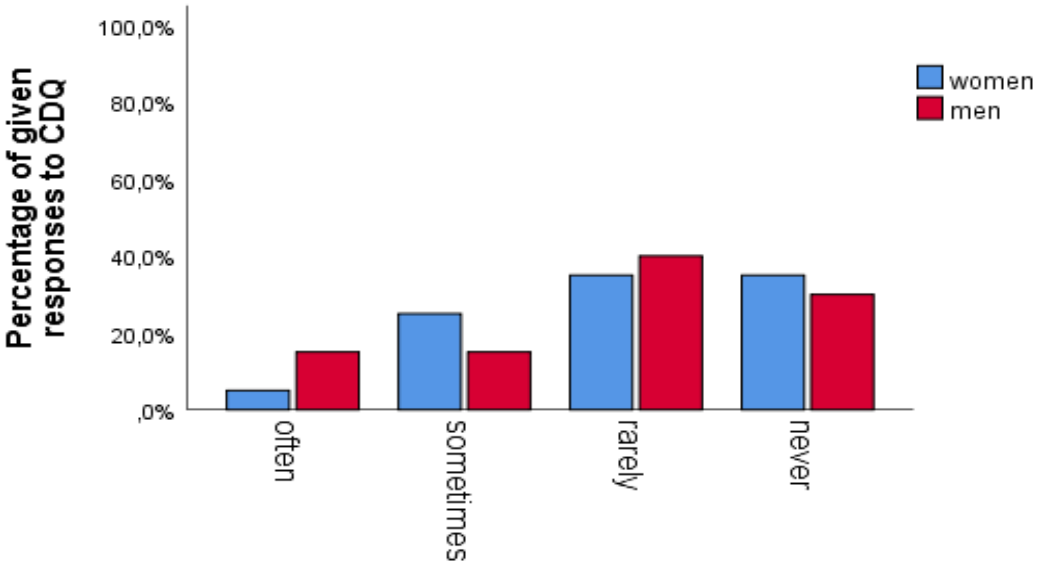

Figure 9: It shows the percentage sexual differences in arguing about which TV show or movie to watch. No statistical differences are detectable.

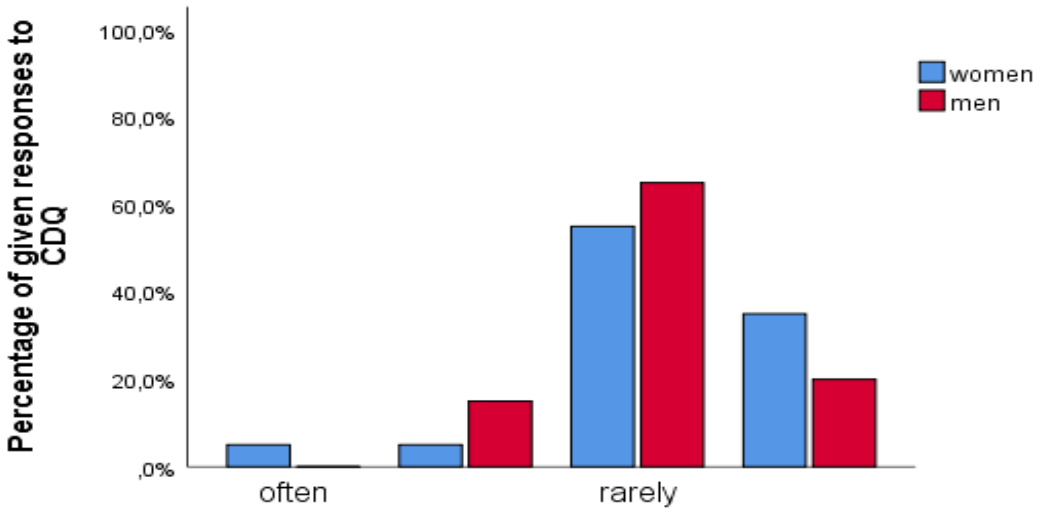

Figure 10: It shows the percentage sexual differences in arguing about spending money on something. No statistical differences are detectable.

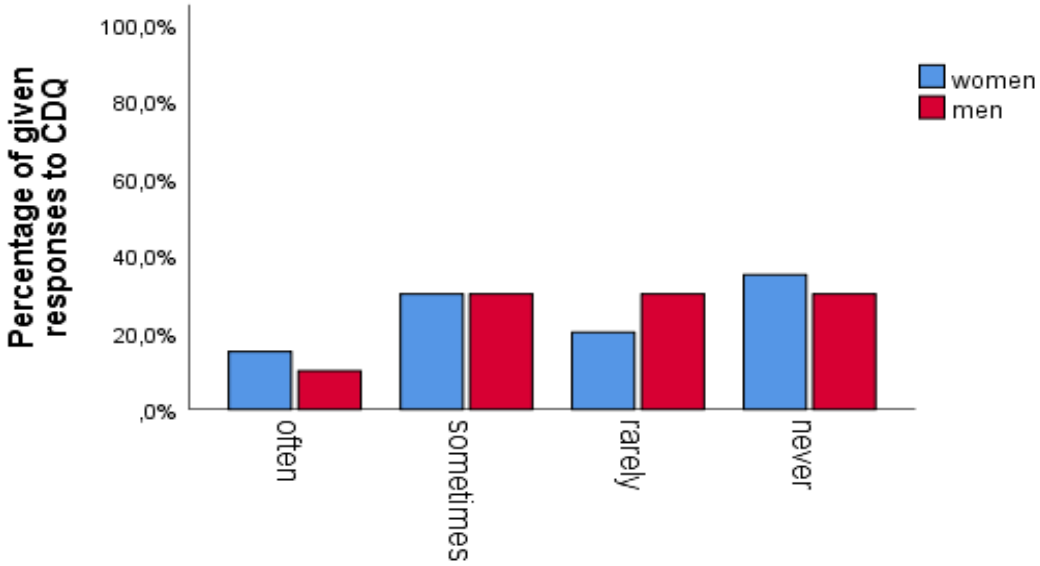

Figure 11: It shows the percentage sexual differences in arguing about leaving an event. No statistical differences are detectable.

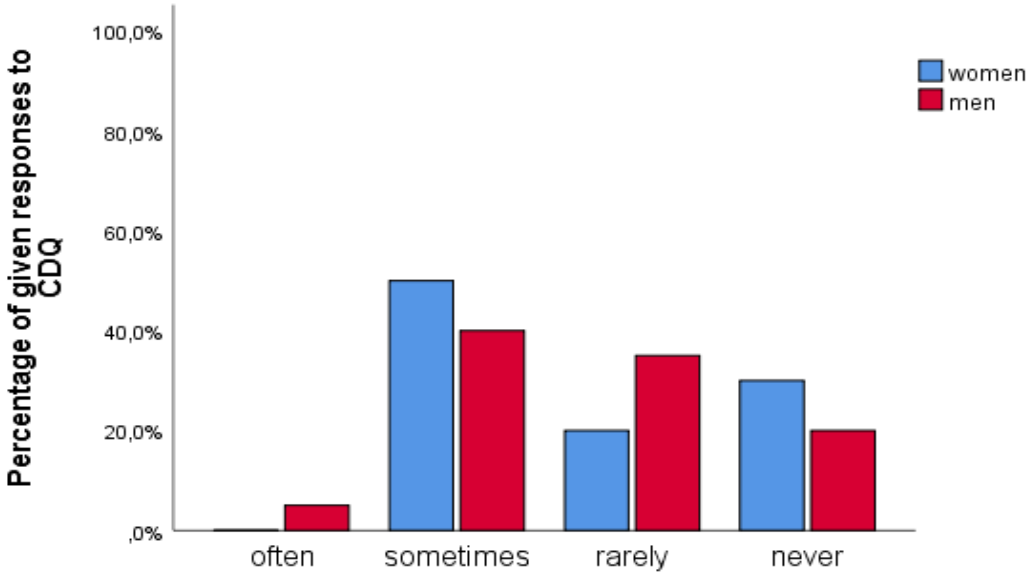

Figure 12: It shows the percentage sexual differences in arguing about having sex. No statistical differences are detectable.

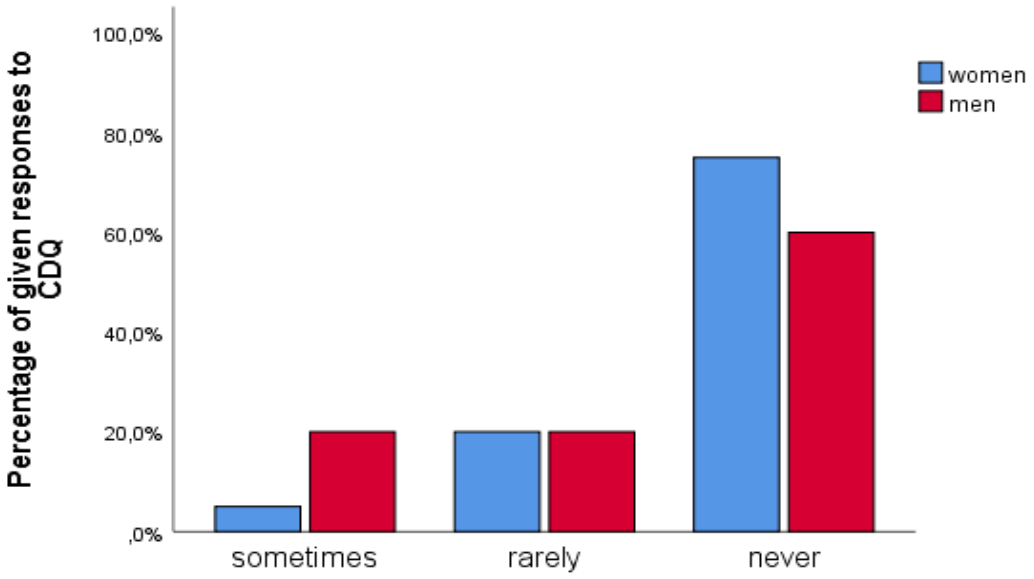

Figure 13: It shows the percentage sexual differences in arguing about doing things for fun. No statistical differences are detectable.

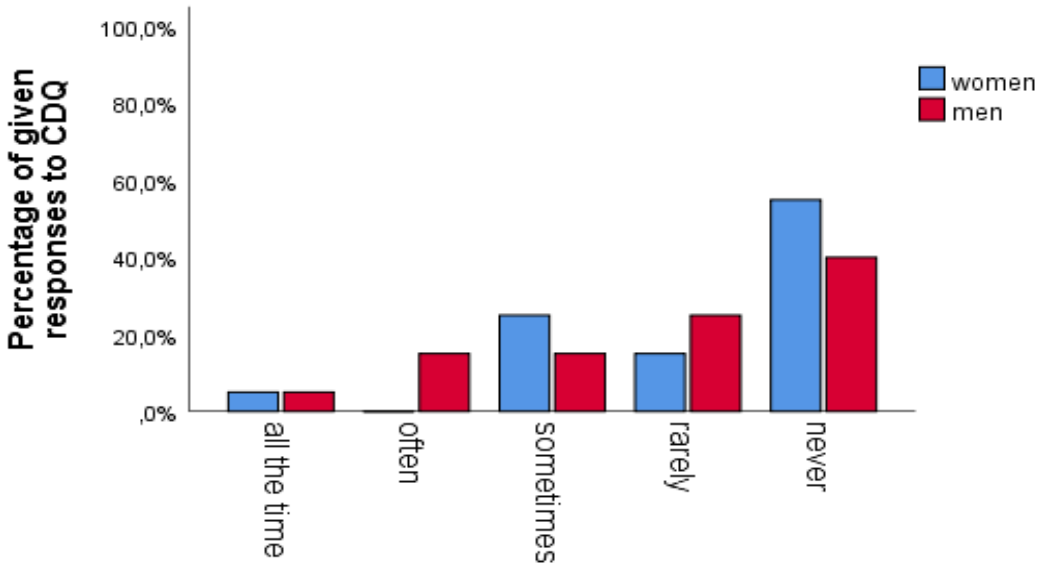

Figure 14: It shows the percentage sexual differences in arguing about what to eat. No statistical differences are detectable.

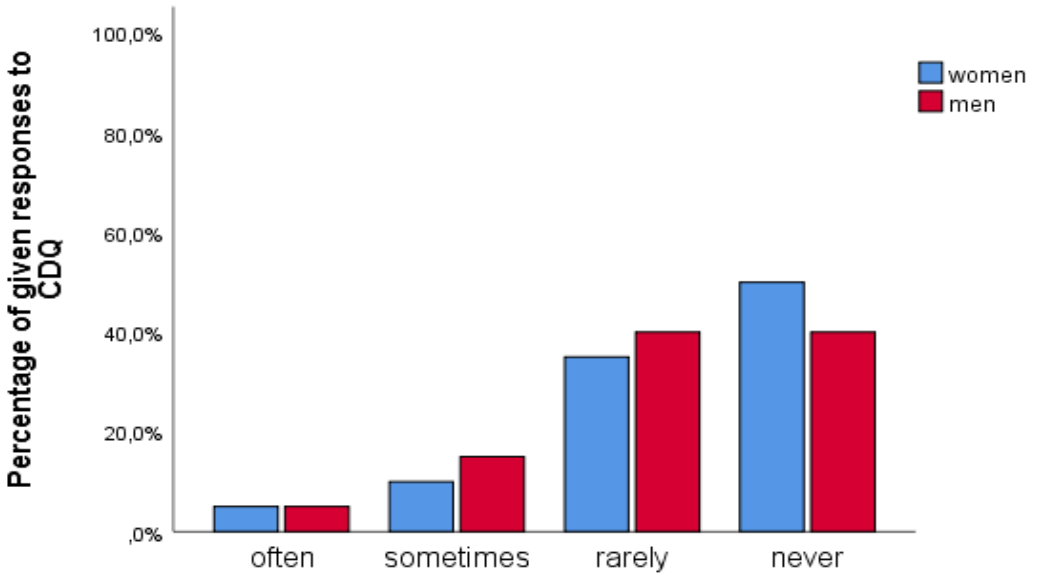

Figure 15: It shows the percentage sexual differences in arguing about doing things together rather than separately. No statistical differences are detectable.

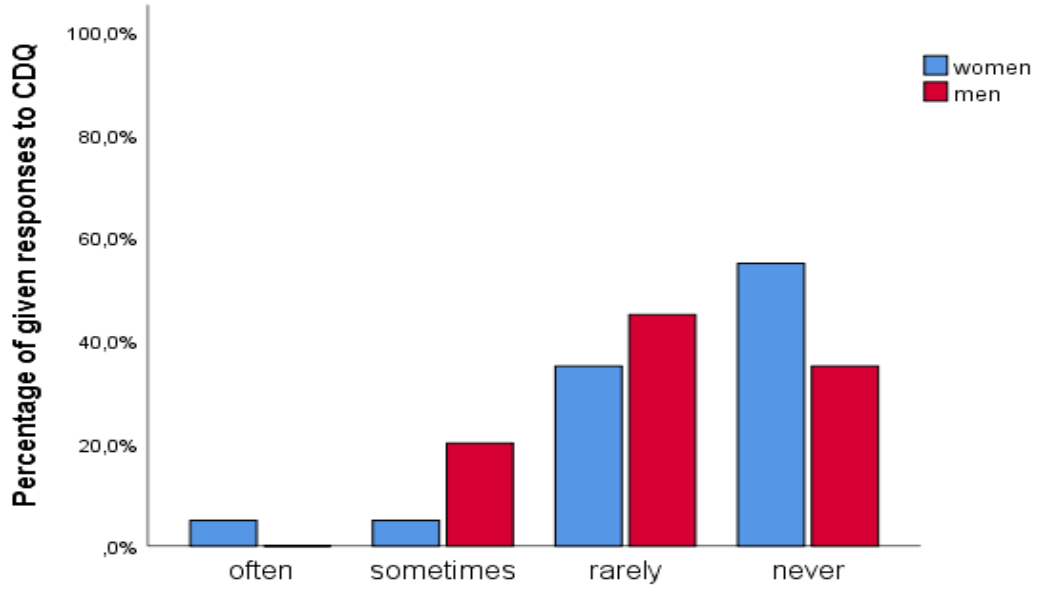

Figure 16: It shows the percentage sexual differences in arguing about where to go out. No statistical differences are detectable.

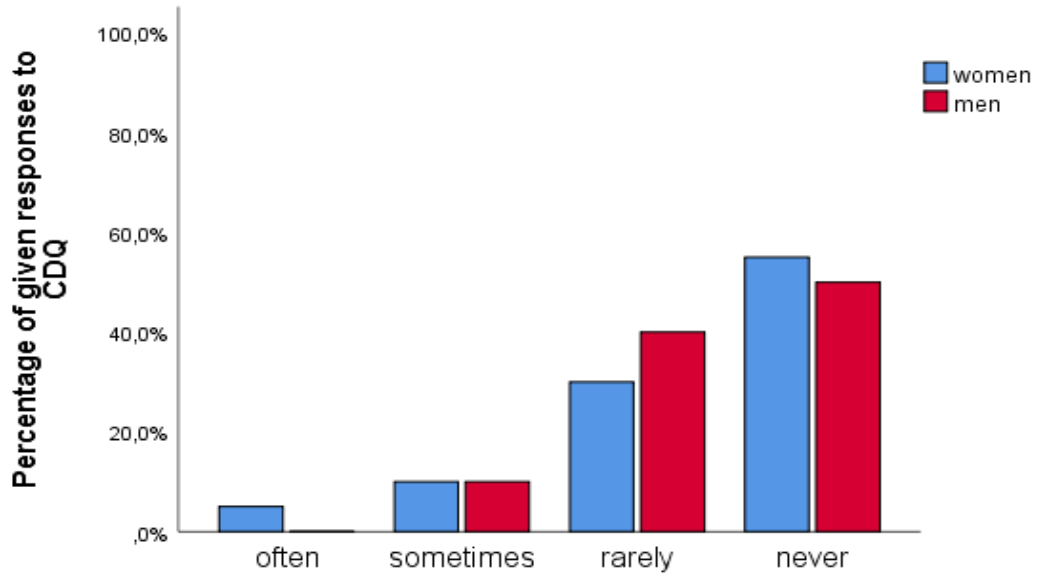

Figure 17: It shows the percentage sexual differences in arguing about which events to go to. No statistical differences are detectable.

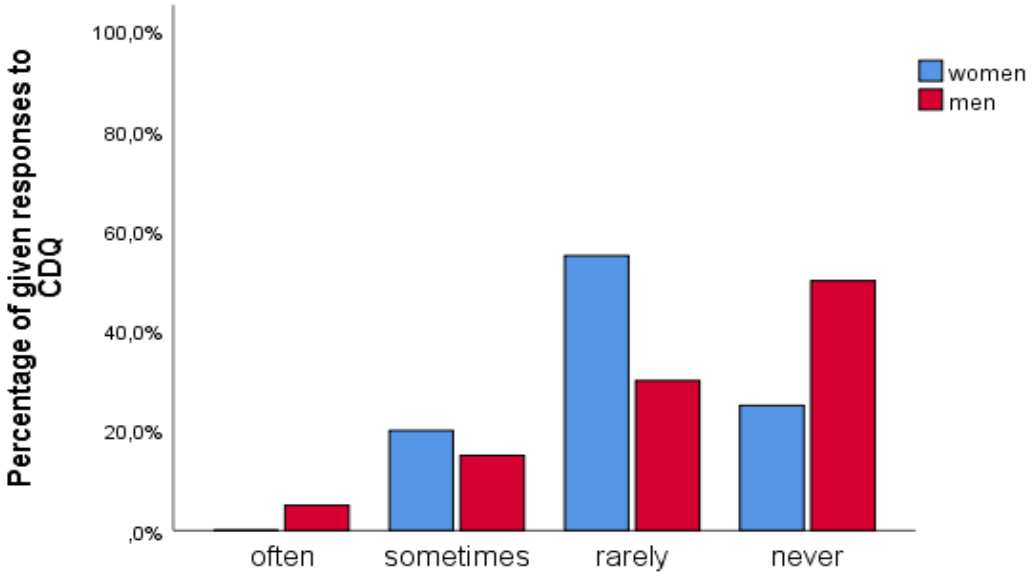

Figure 18: It shows the percentage sexual differences in arguing about spending weekends. No statistical differences are detectable.

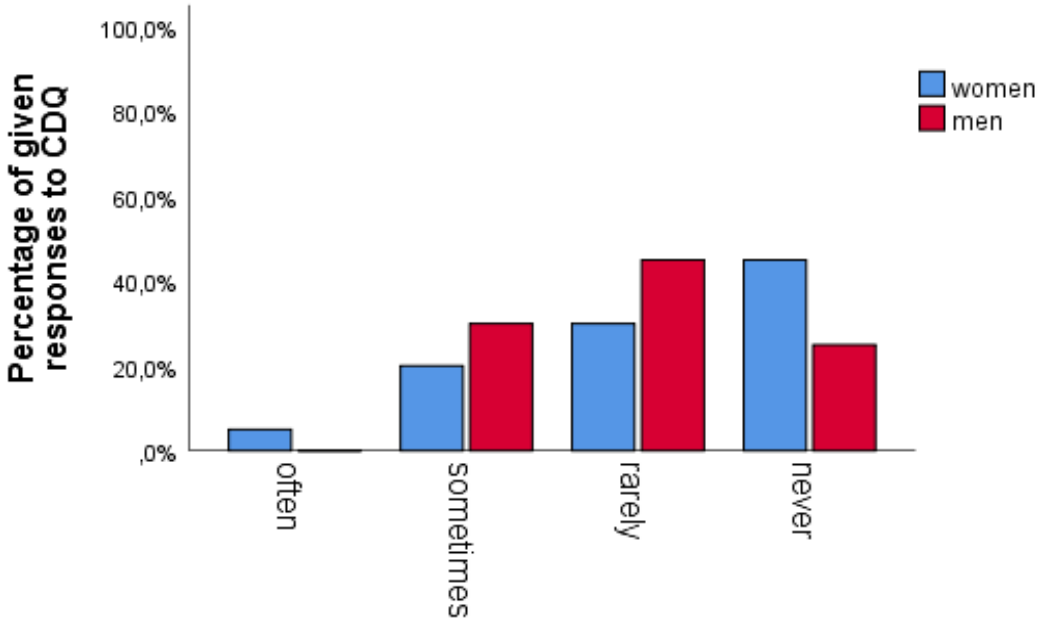

Figure 19: It shows the percentage sexual differences in arguing about going out to places. No statistical differences are detectable.

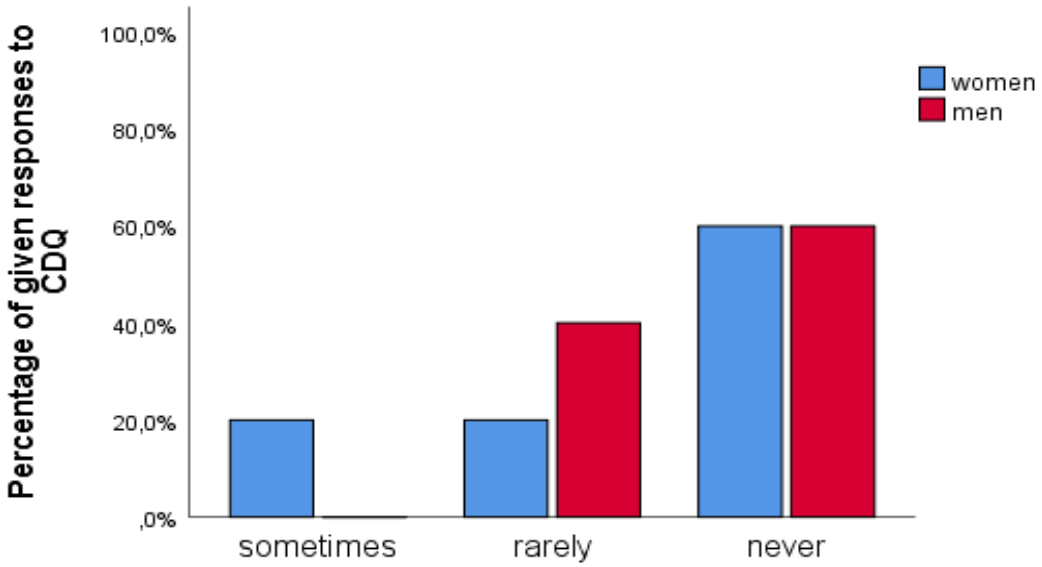

Figure 20: It shows the percentage sexual differences in arguing about displaying affection in public. No statistical differences are detectable.

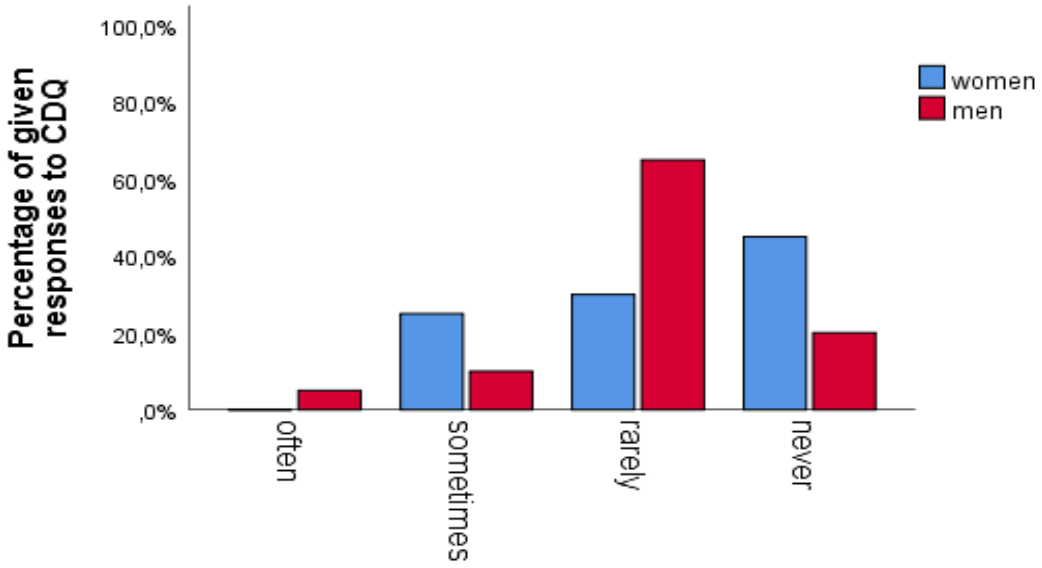

Figure 21: It shows the percentage sexual differences in arguing about making purchases. No statistical differences are detectable.

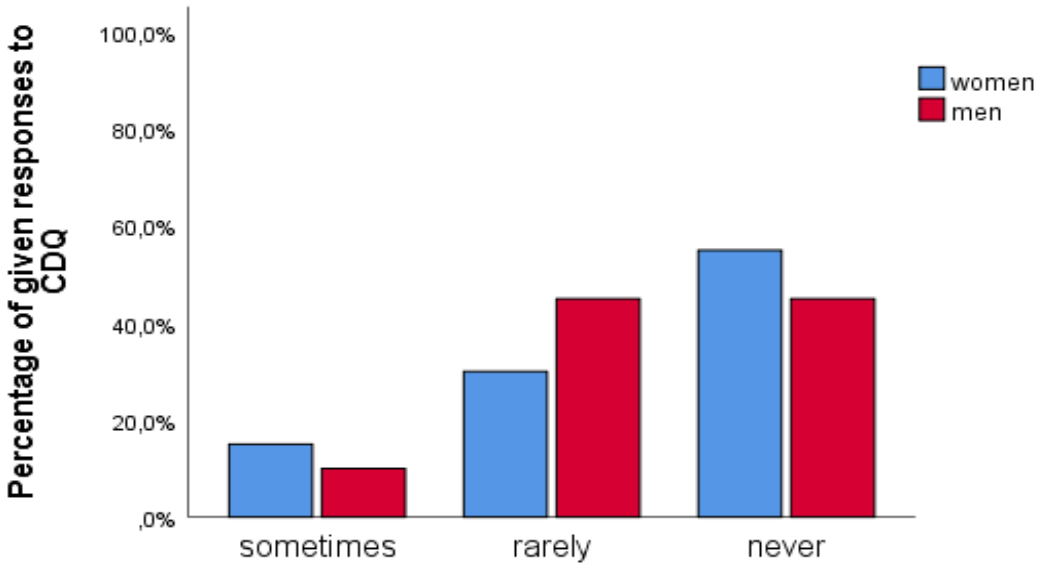

Figure 22: It shows the percentage sexual differences in arguing about paying for things. No statistical differences are detectable.

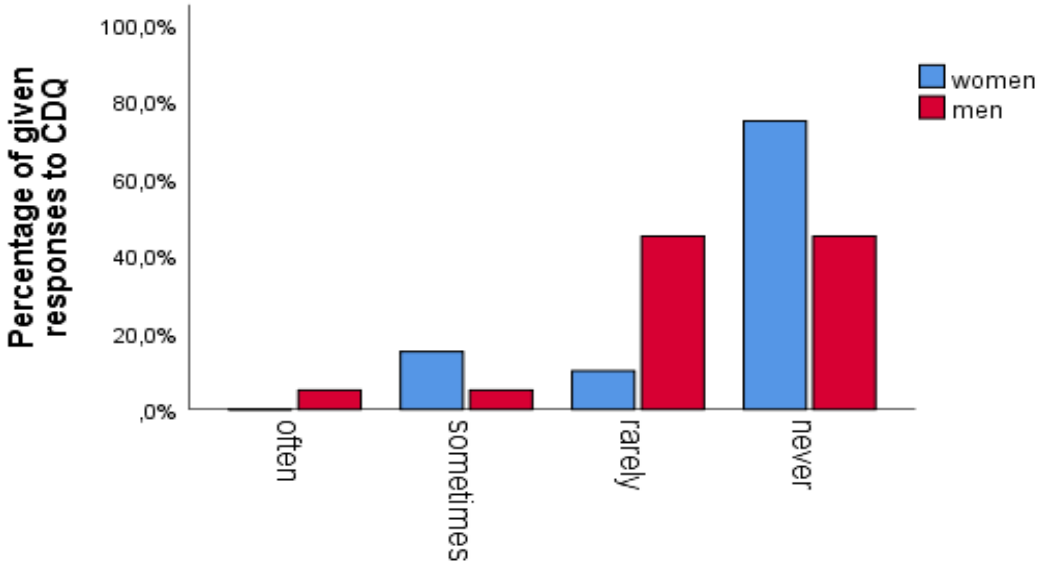

Figure 23: It shows the percentage sexual differences in arguing about meeting with the family. No statistical differences are detectable.

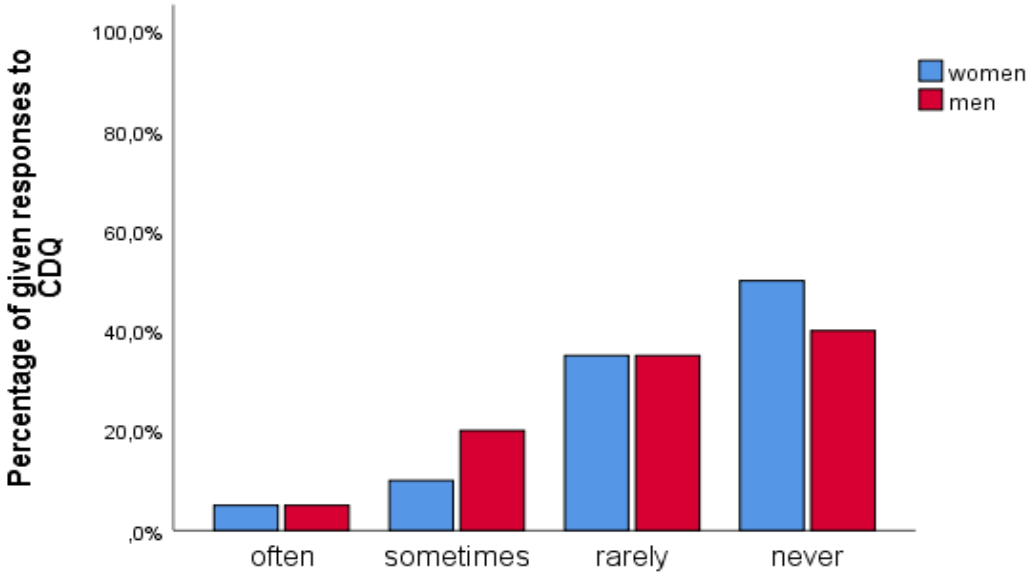

Figure 24: It shows the percentage sexual differences in arguing about how much time to spend together. No statistical differences are detectable.

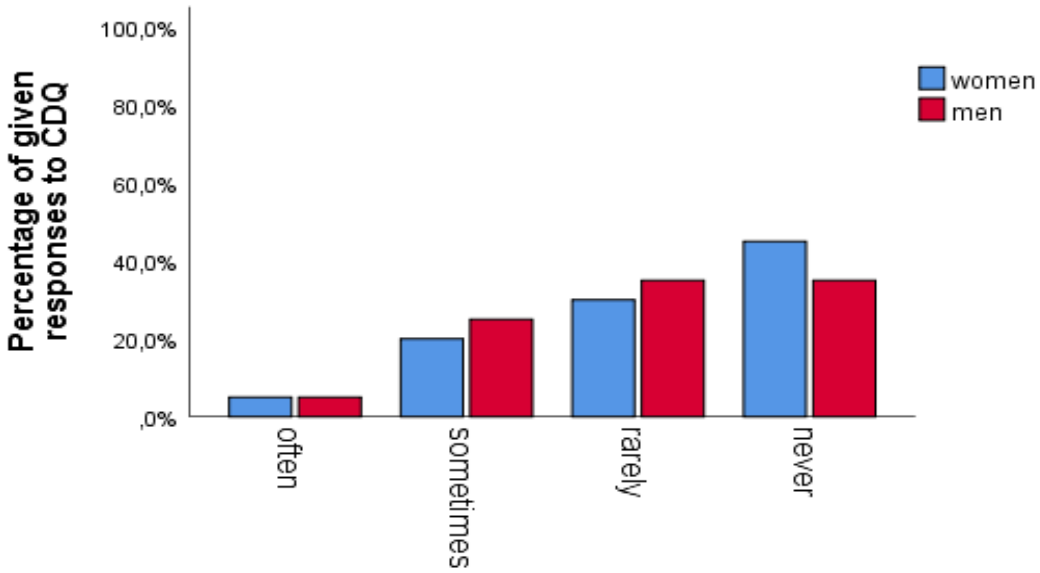

Figure 25: It shows the percentage sexual differences in arguing about engaging in sexual acts. No statistical differences are detectable.

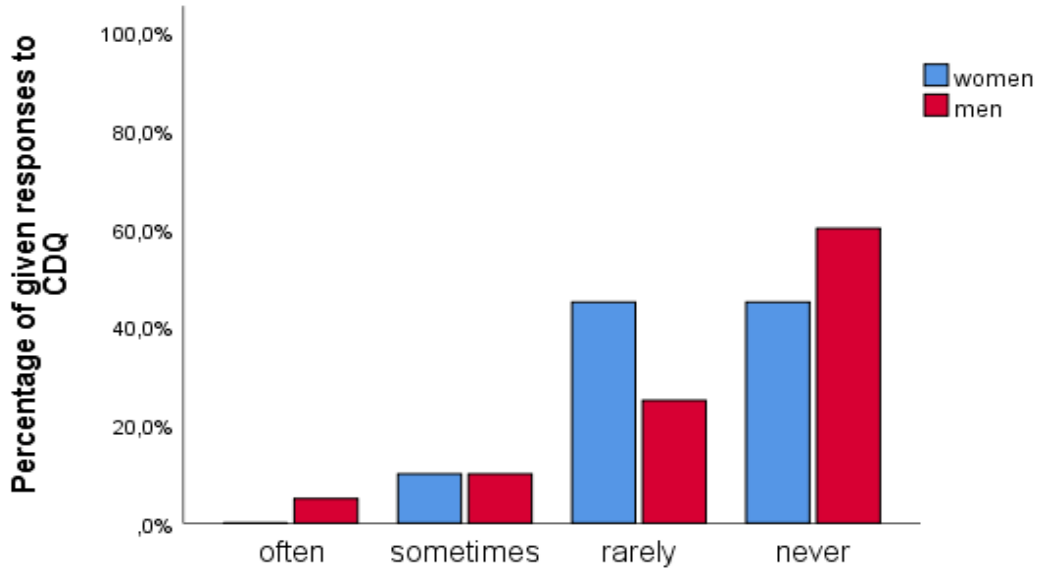

Figure 26: It shows the percentage sexual differences in arguing about future career plans. No statistical differences are detectable.

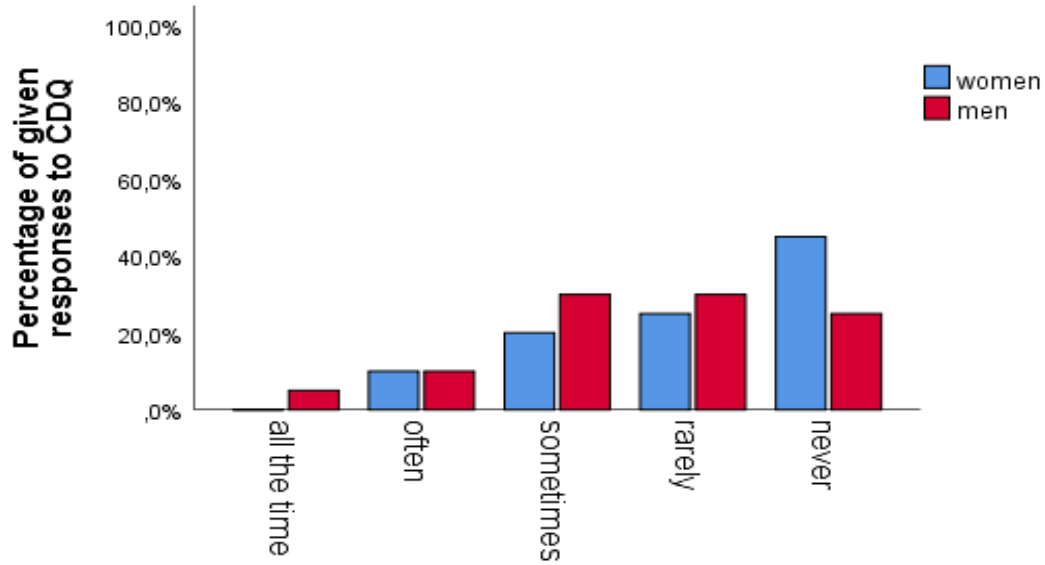

Figure 27: It shows the percentage sexual differences in arguing about sharing emotions. No statistical differences are detectable.

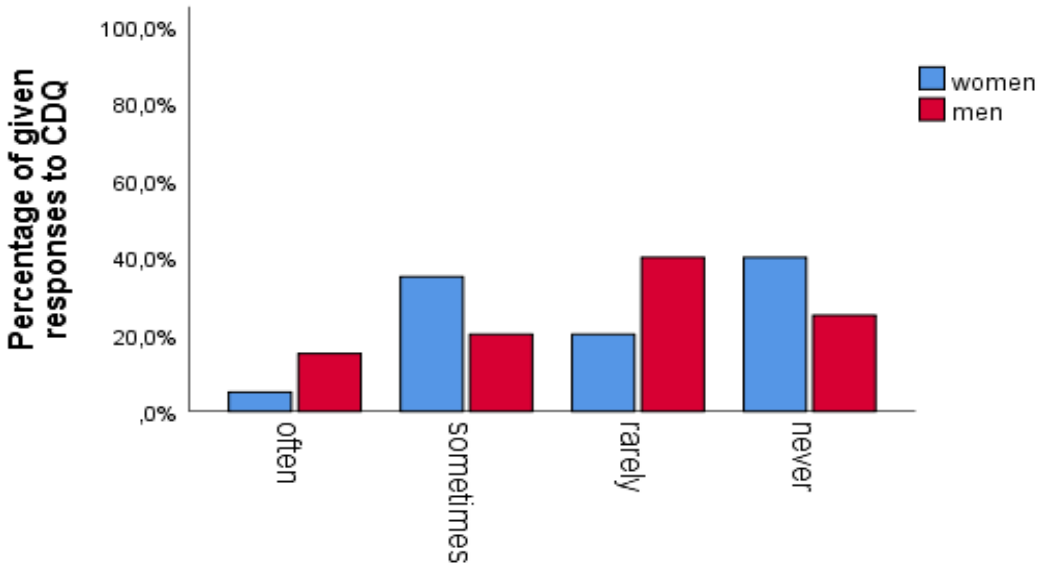

Figure 28: It shows the percentage sexual differences in arguing about discussing feelings. No statistical differences are detectable.

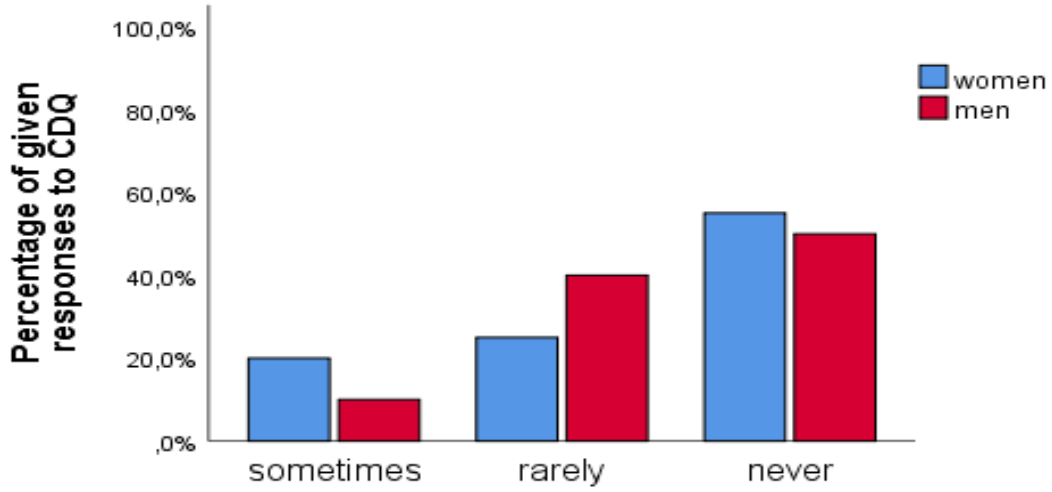

Figure 29: It shows the percentage sexual differences in arguing about what to play. No statistical differences are detectable.

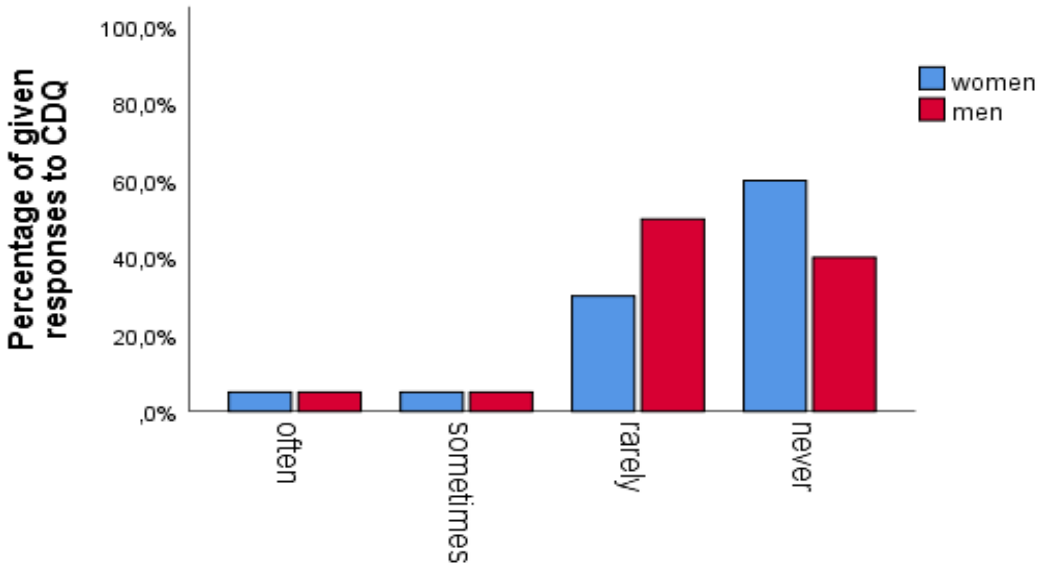

Figure 30: It shows the percentage sexual differences in arguing about where to go out to eat. No statistical differences are detectable.

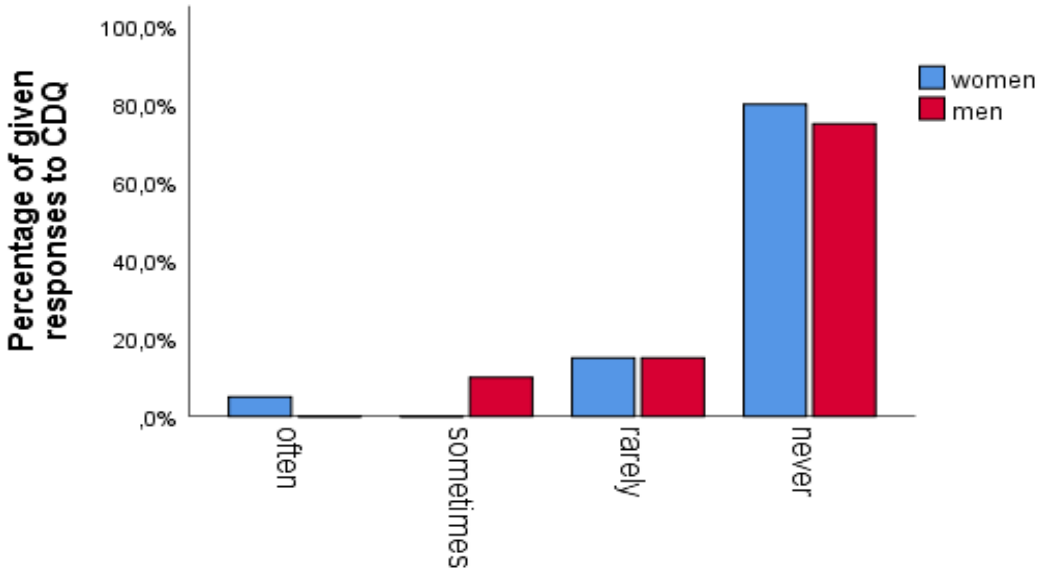

Figure 31: It shows the percentage sexual differences in arguing about the seriousness of the relationship. No statistical differences are detectable.

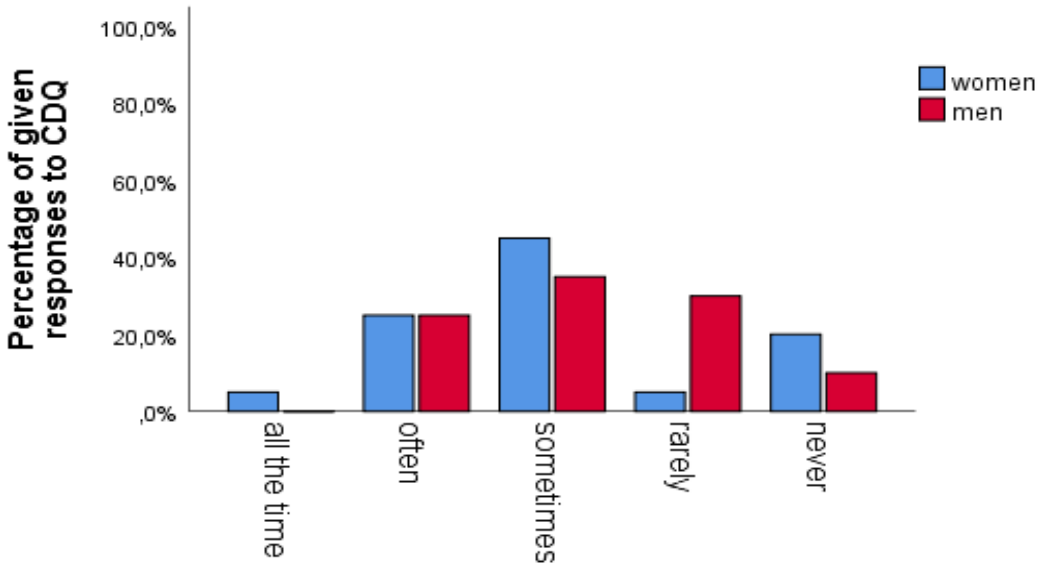

Figure 32: It shows the percentage sexual differences in arguing about who is to blame. No statistical differences are detectable.

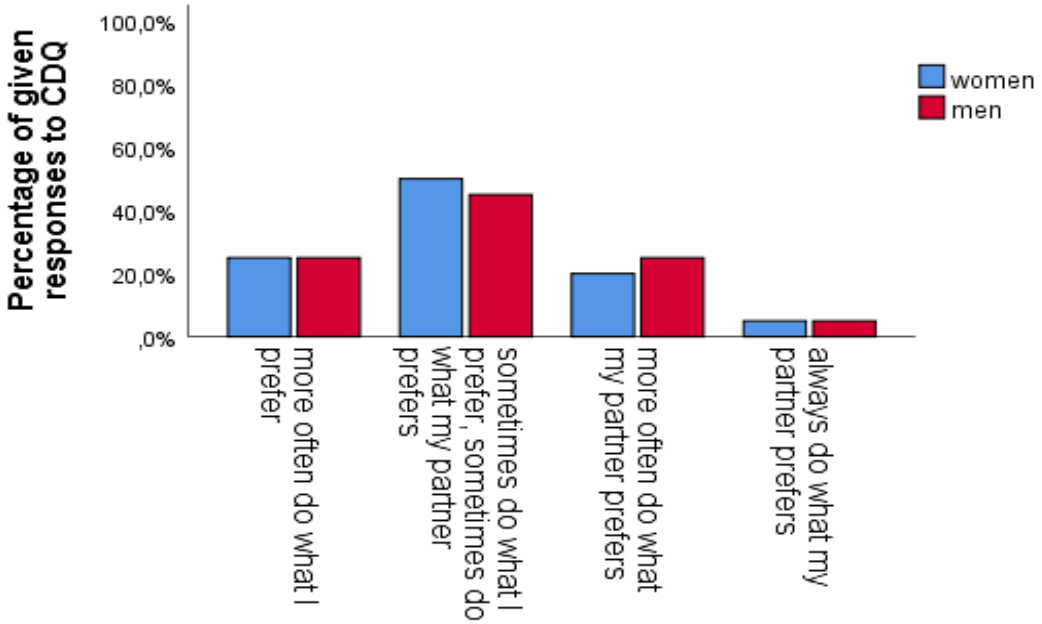

Figure 33: It shows the percentage sexual differences in engaging in sexual acts. No statistical differences are detectable.

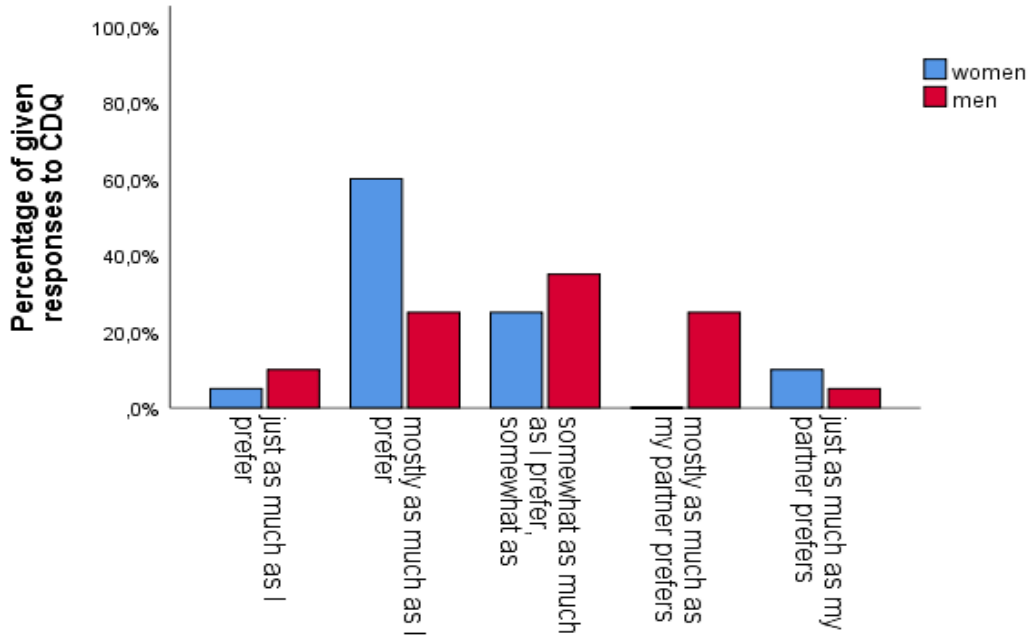

Figure 34: It shows the percentage sexual differences in talking about the attractiveness of other women/men. No statistical differences are detectable.

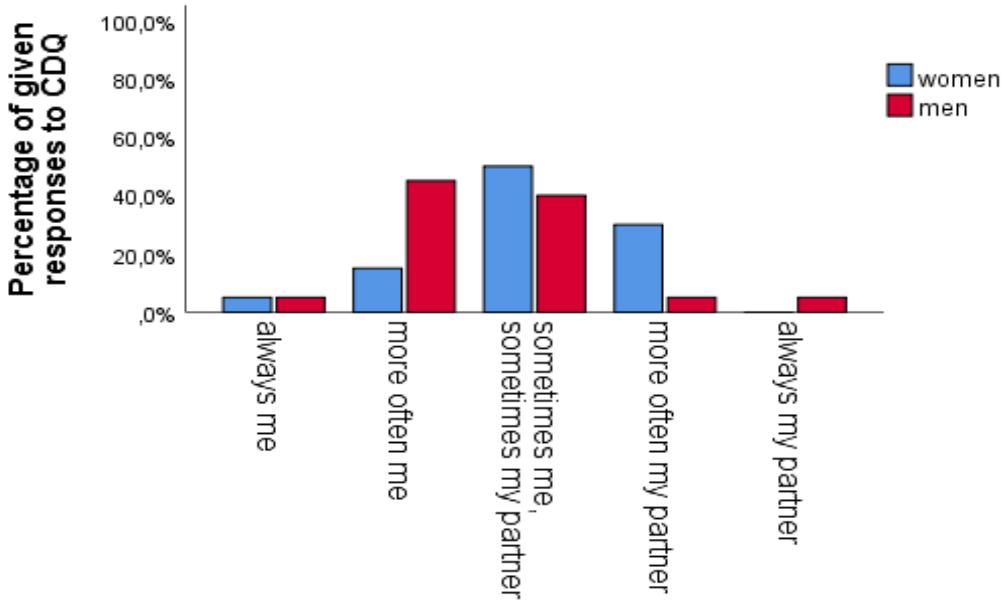

Figure 35: It shows the percentage sexual differences in blaming one for an argument. No statistical differences are detectable.

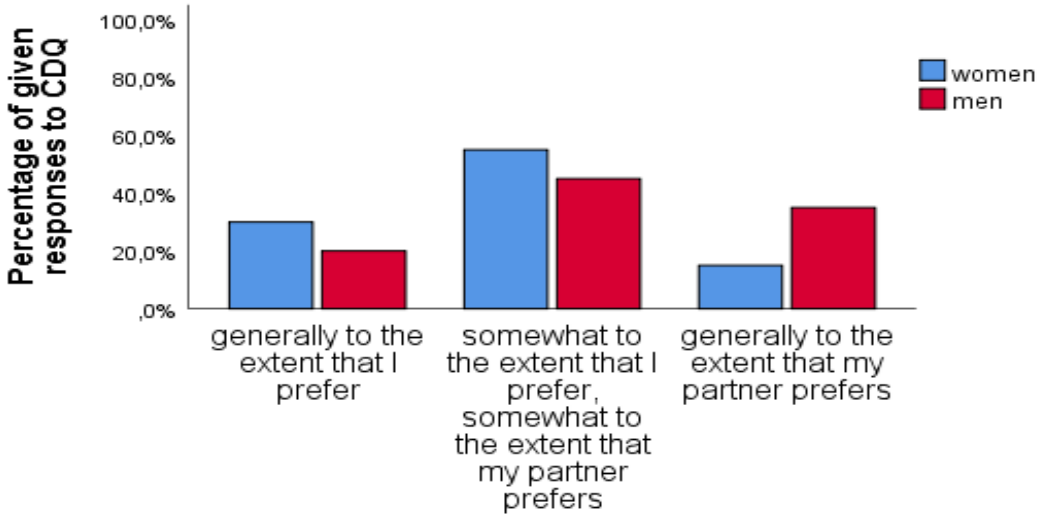

Figure 36: It shows the percentage sexual differences in discussing feelings. No statistical differences are detectable.

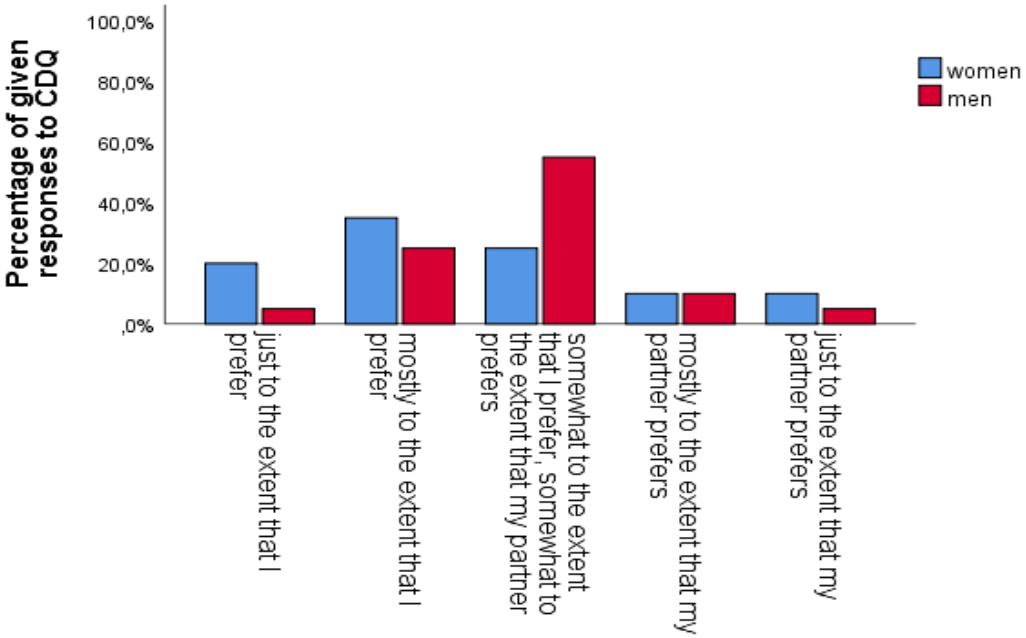

Figure 37: It shows the percentage sexual differences in giving attention to other men/women. No statistical differences are detectable.

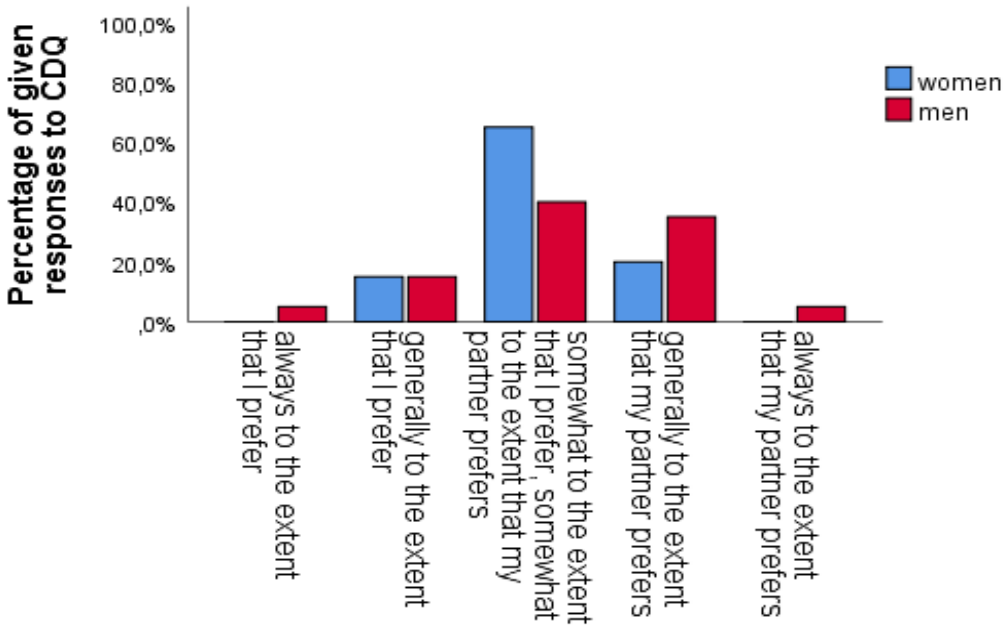

Figure 38: It shows the percentage sexual differences in sharing emotions. No statistical differences are detectable.

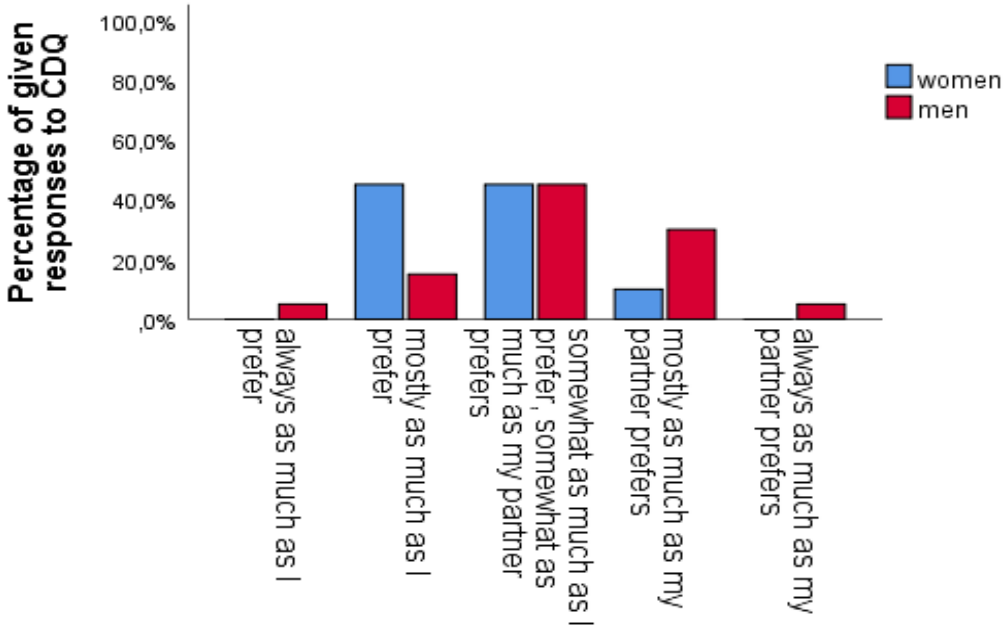

Figure 39: It shows the percentage sexual differences in spending time with friends. No statistical differences are detectable.

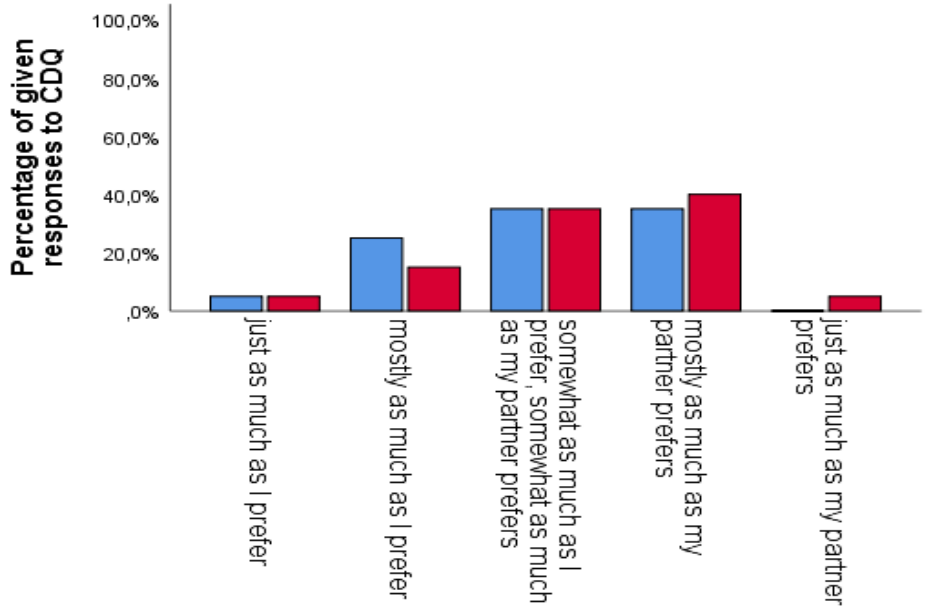

Figure 40: It shows the percentage sexual differences in having sex. No statistical differences are detectable.

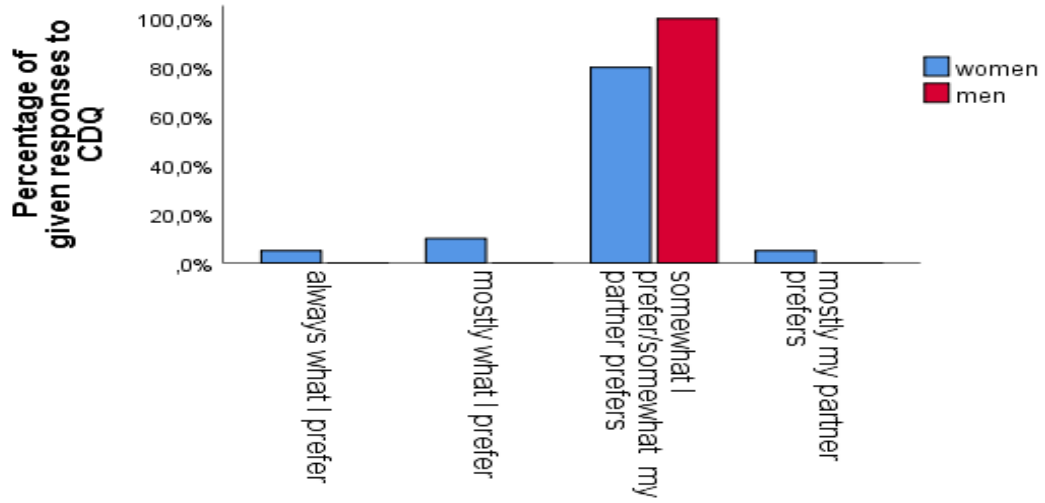

Figure 41: It shows the percentage sexual differences in spending money on something. No statistical differences are detectable.

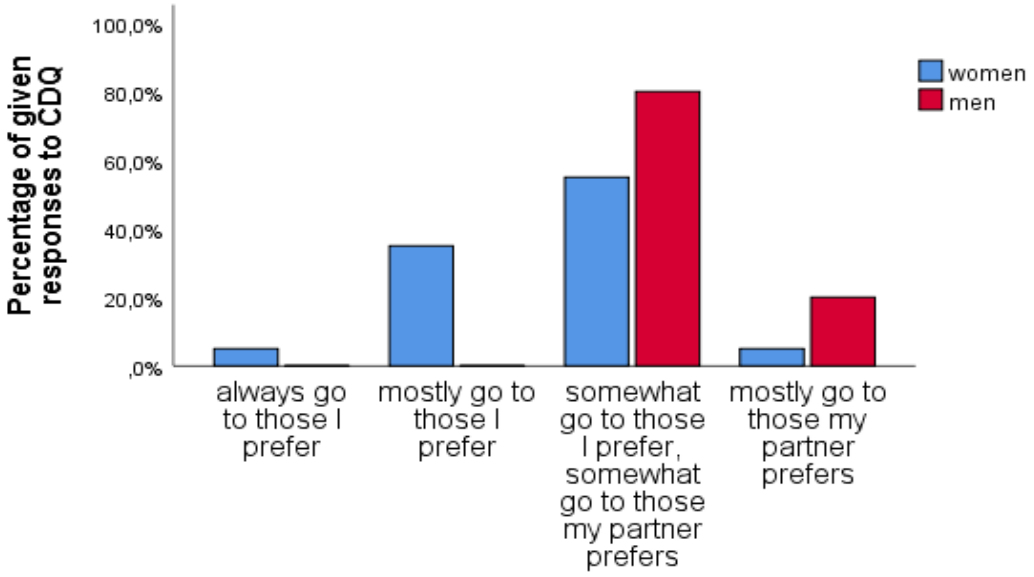

Figure 42: It shows the percentage sexual differences in going out to events. A Kruskal Wallis test showed that there was a statistical significant difference between females´ and males´ responses (Chi square = 8.775, p = .003, df = 1).

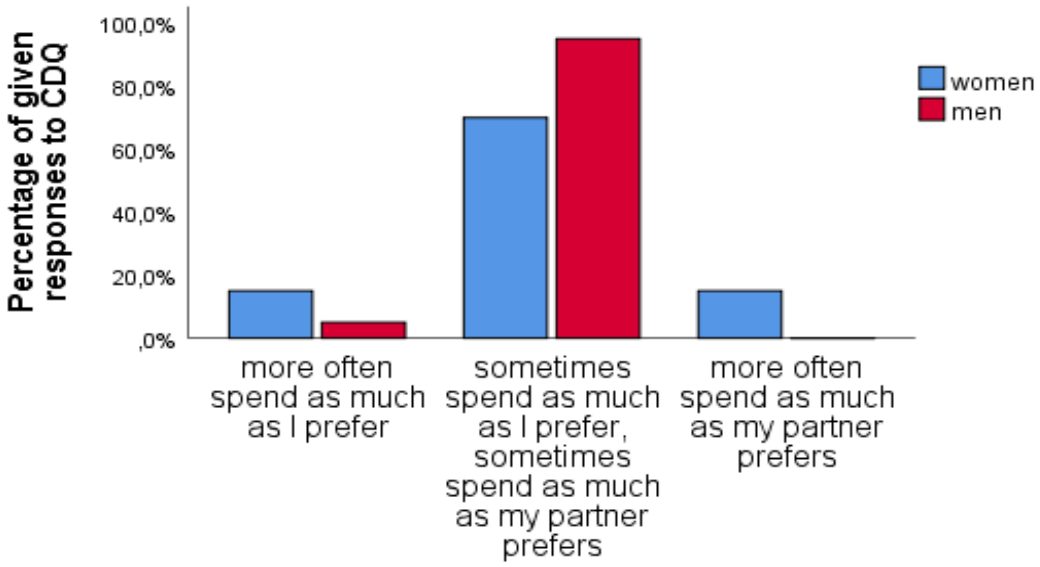

Figure 43: It shows the percentage sexual differences in spending money. A Kruskal Wallis test showed that there was a statistical significant difference between females´ and males´ responses (Chi square = 8.775, p = .003, df = 1).

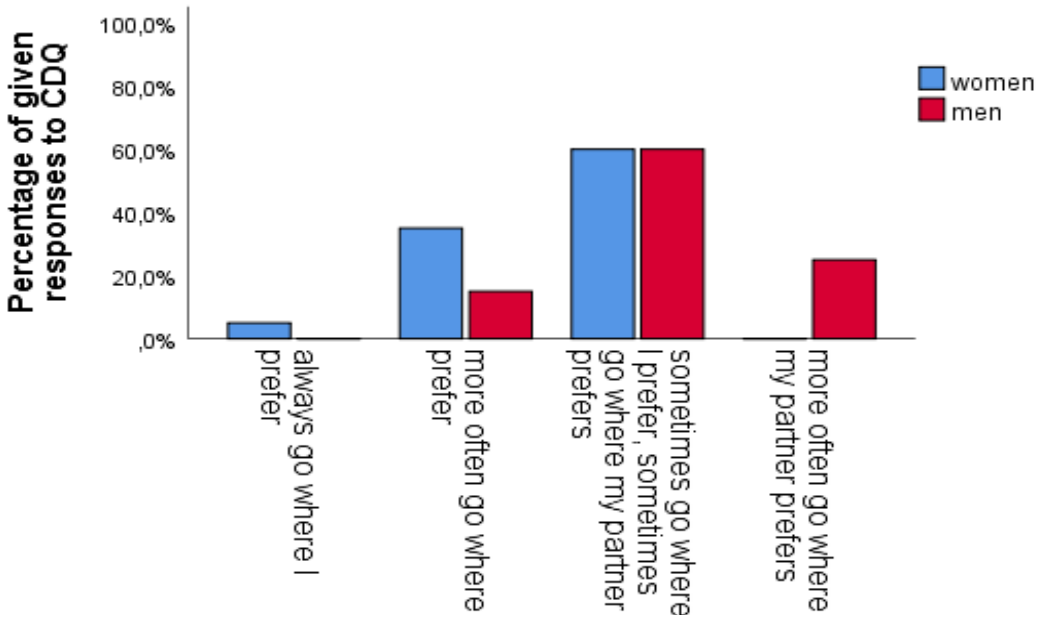

Figure 44: It shows the percentage sexual differences in going out to eat. A Kruskal Wallis test showed that there was a statistical significant difference between females´ and males´ responses (Chi square = 8.775, p = .003, df = 1).

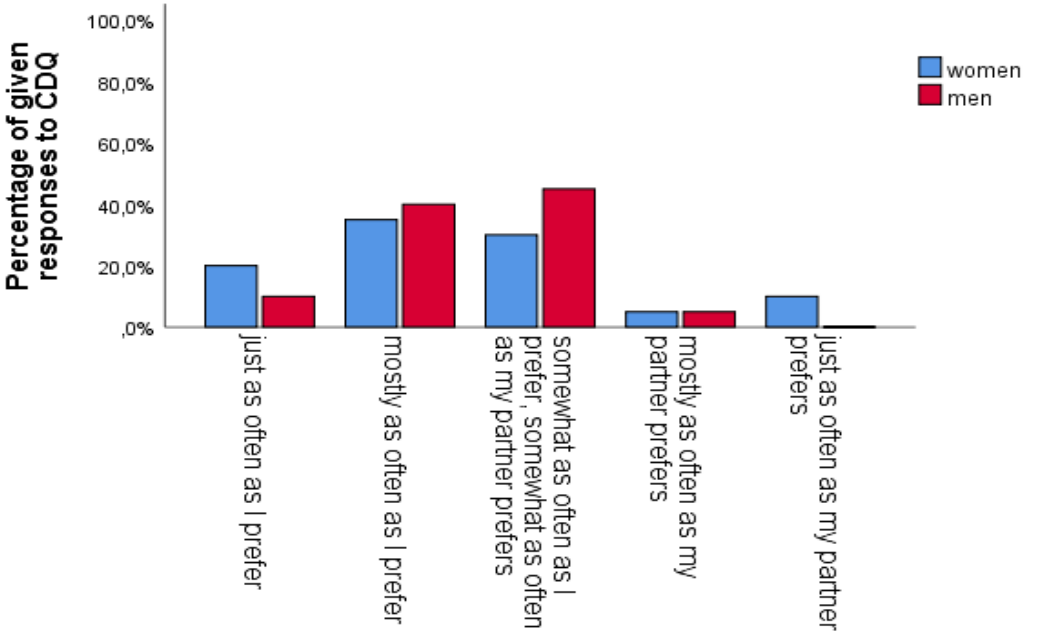

Figure 45: It shows the percentage sexual differences in cleaning. A Kruskal Wallis test showed that there was a statistical significant difference between females´ and males´ responses (Chi square = 8.775, p = .003, df = 1).

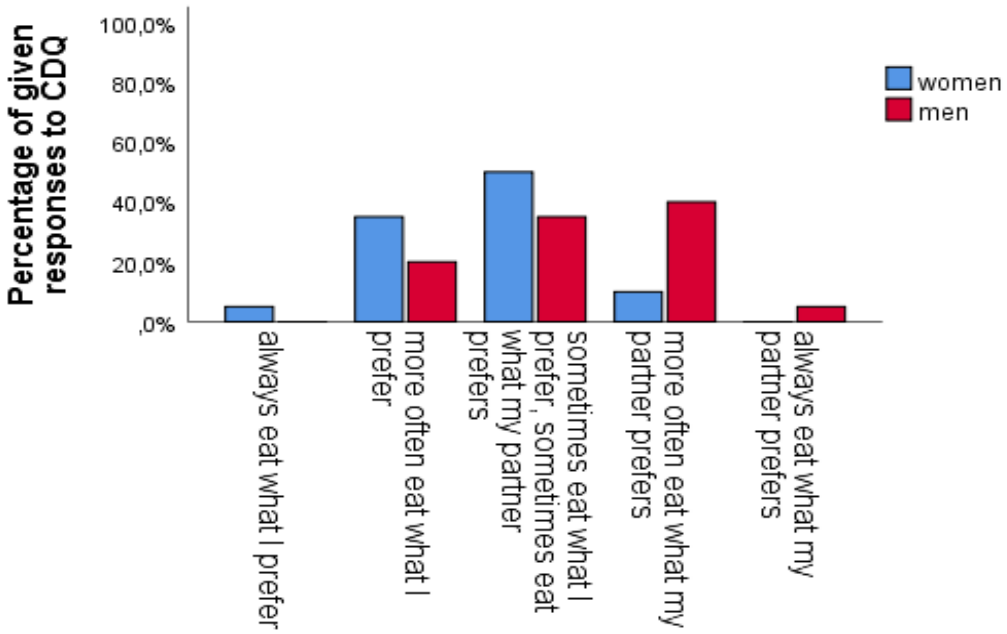

Figure 46: It shows the percentage sexual differences in deciding what to eat. A Kruskal Wallis test showed that there was a statistical significant difference between females´ and males´ responses (Chi square = 8.775, p = .003, df = 1).

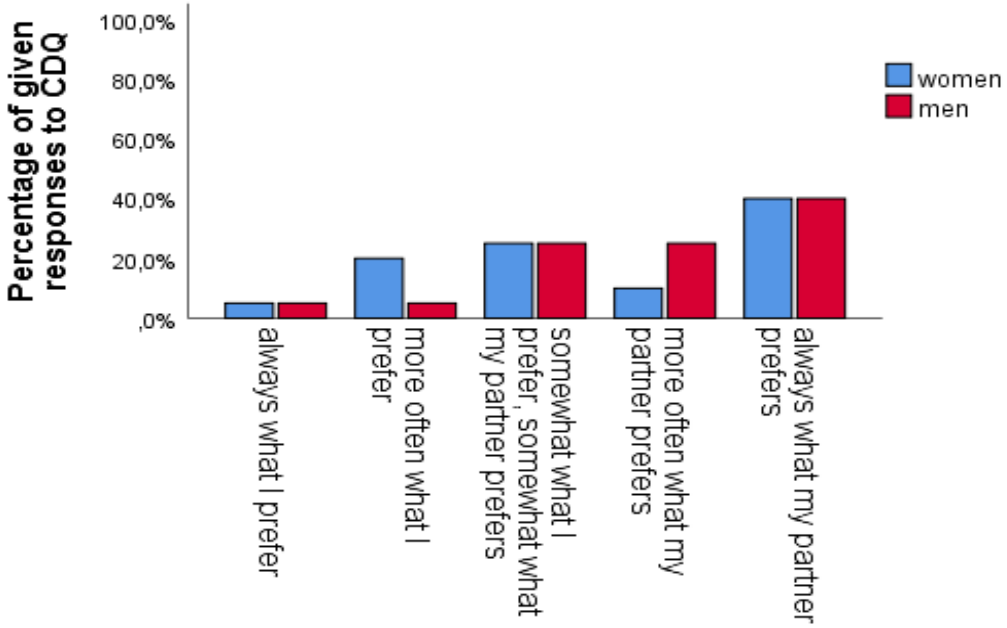

Figure 47: It shows the percentage sexual differences in terms of clothing. No statistical differences are detectable.

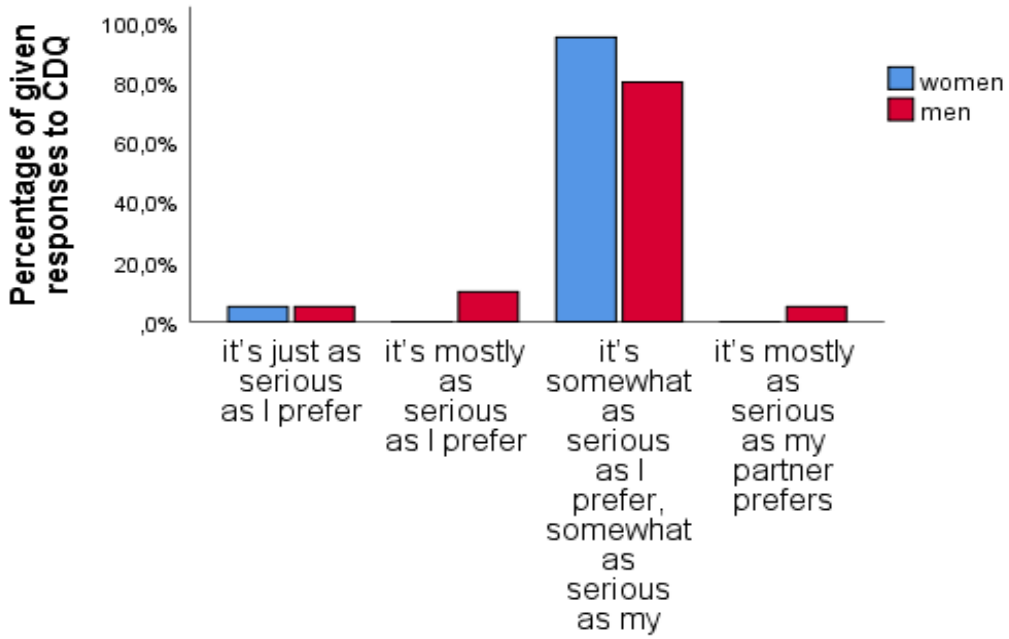

Figure 48: It shows the percentage sexual differences in terms of seriousness of the relationship. No statistical differences are detectable.

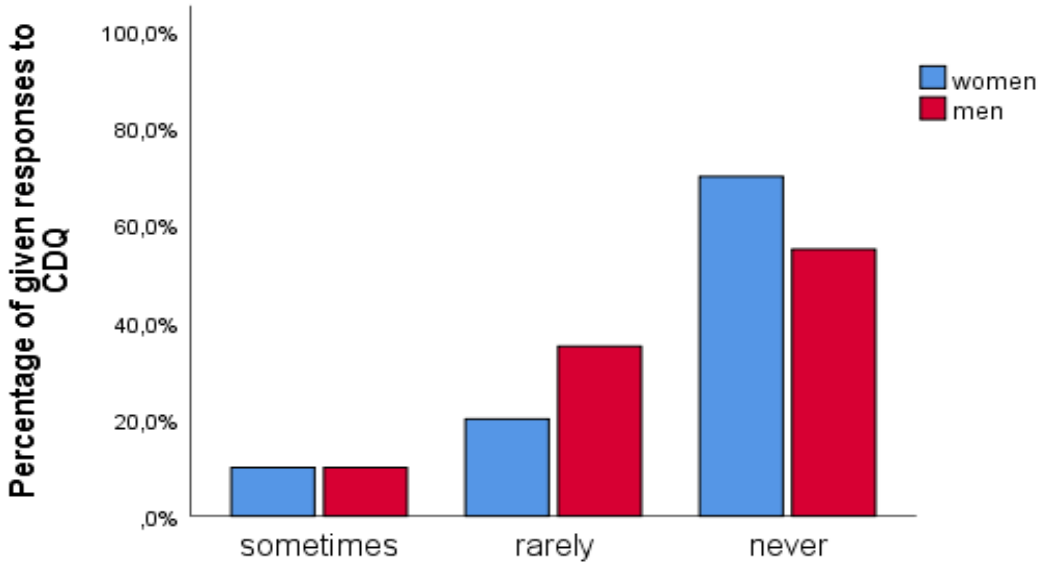

Figure 49: It shows the percentage sexual differences in arguing about calling. No statistical differences are detectable.

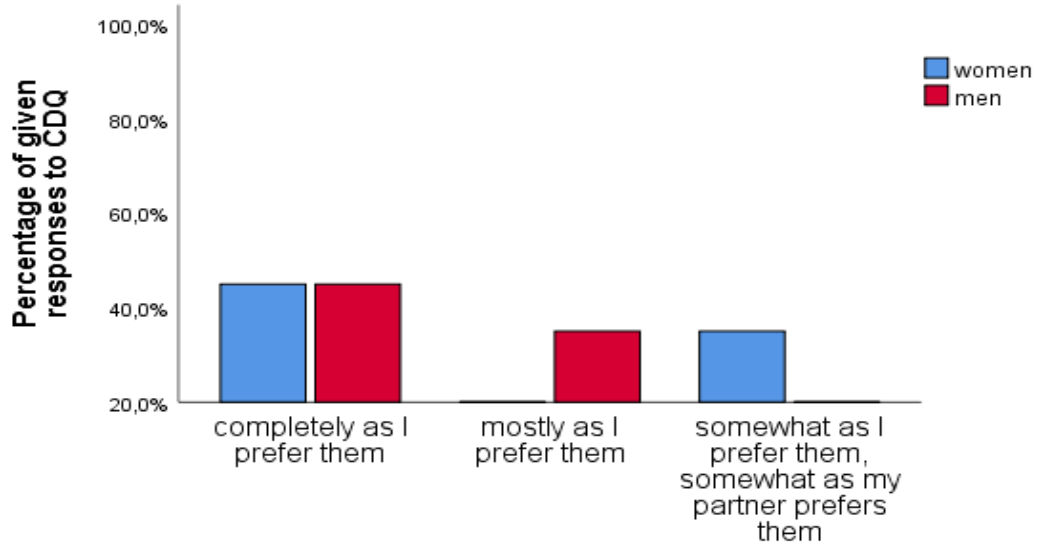

Figure 50: It shows the percentage sexual differences in terms of future careers. No statistical differences are detectable.

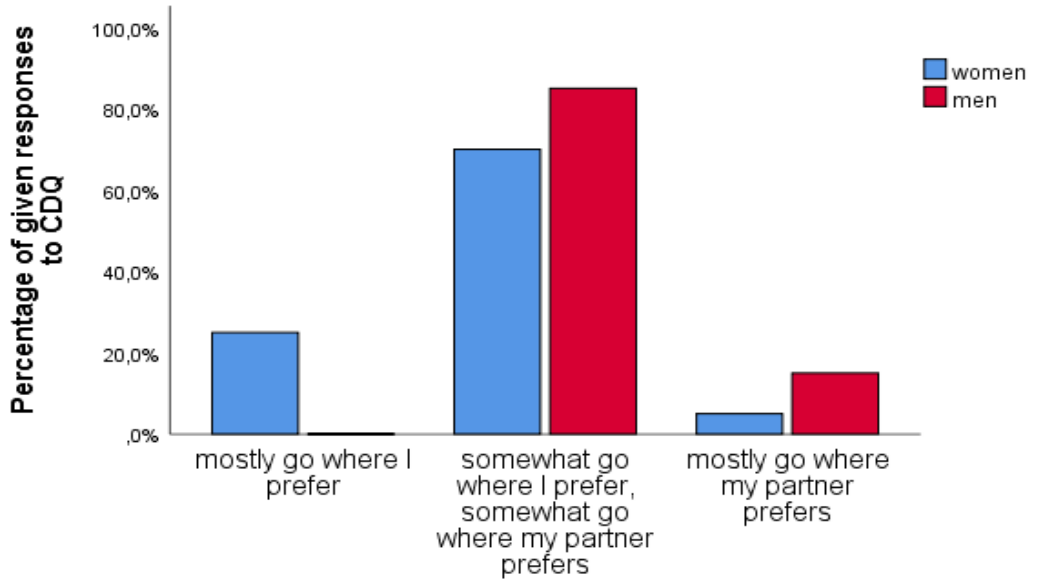

Figure 51: It shows the percentage sexual differences in going out. No statistical differences are detectable.

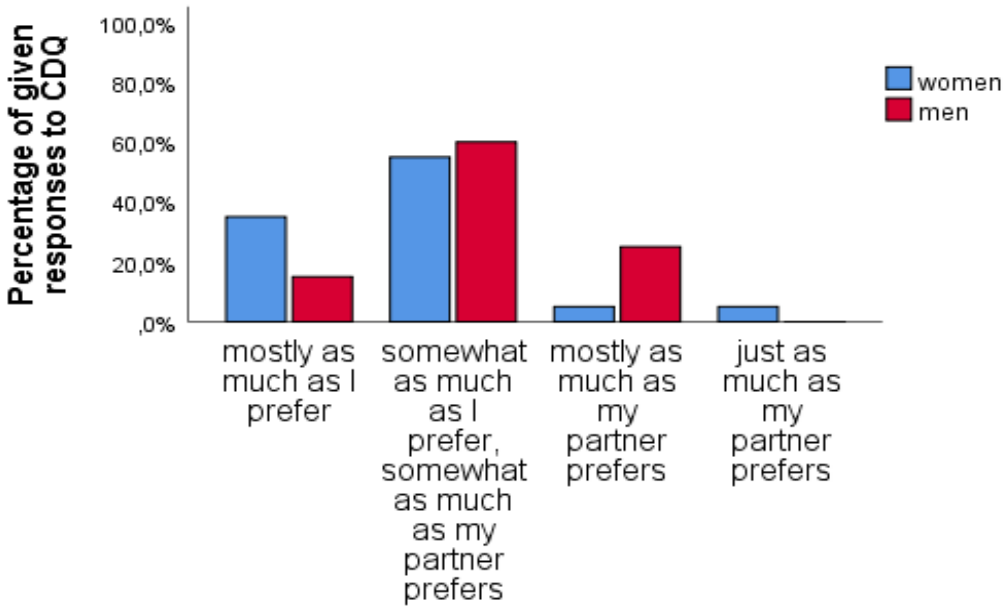

Figure 52: It shows the percentage sexual differences in going out to places. No statistical differences are detectable.

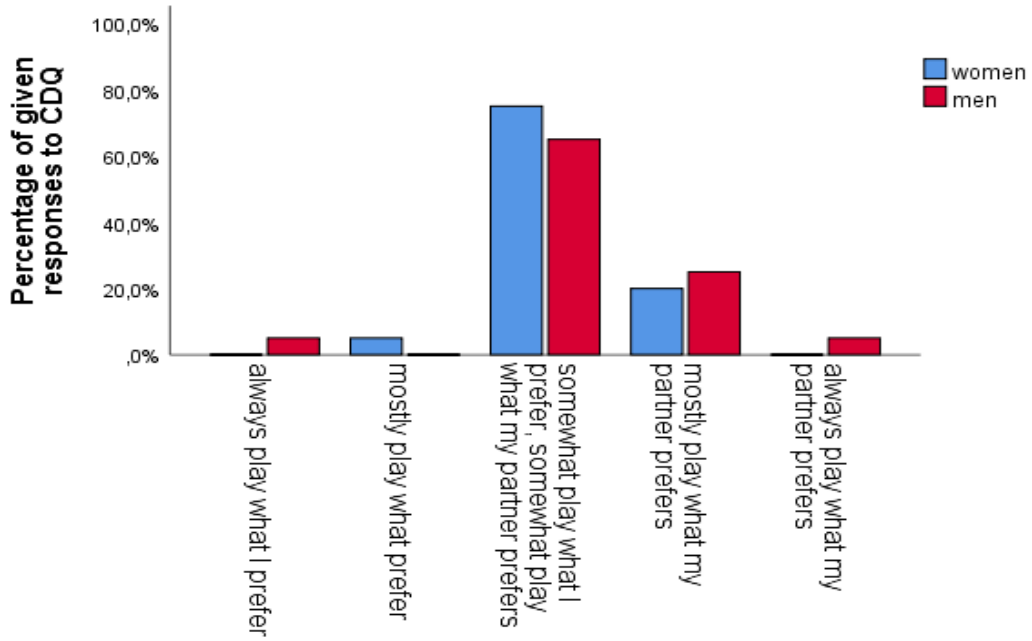

Figure 53: It shows the percentage sexual differences in playing games. No statistical differences are detectable.

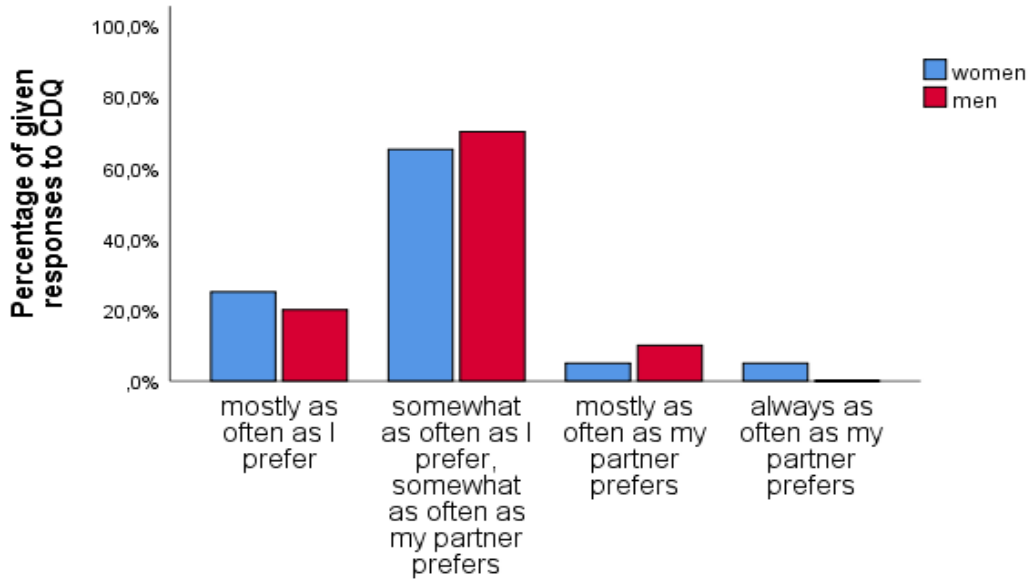

Figure 54: It shows the percentage sexual differences in doing things rather that separately. No statistical differences are detectable.

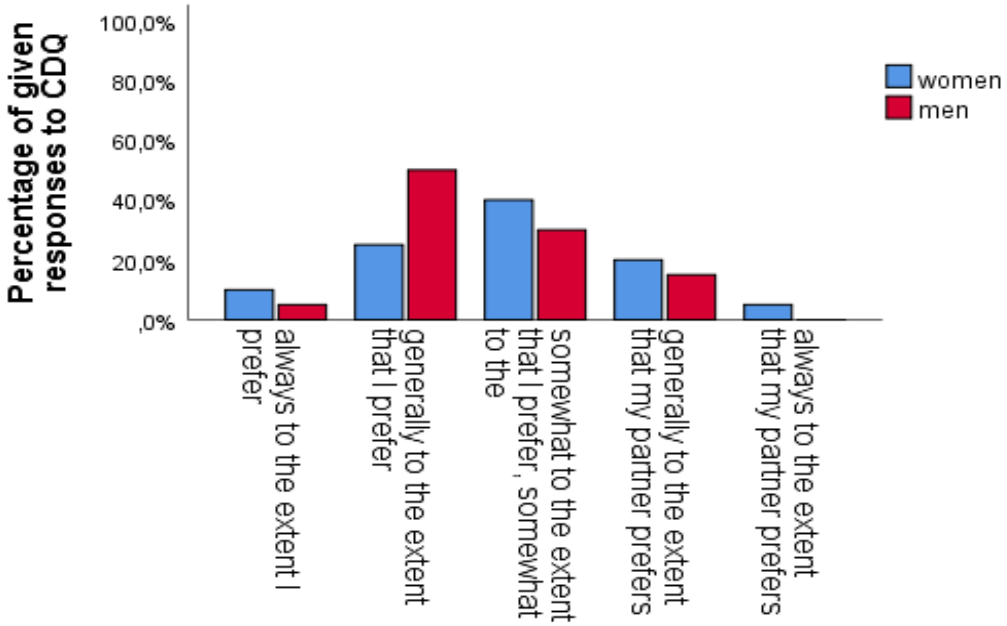

Figure 55: It shows the percentage sexual differences in meeting with the family. No statistical differences are detectable.

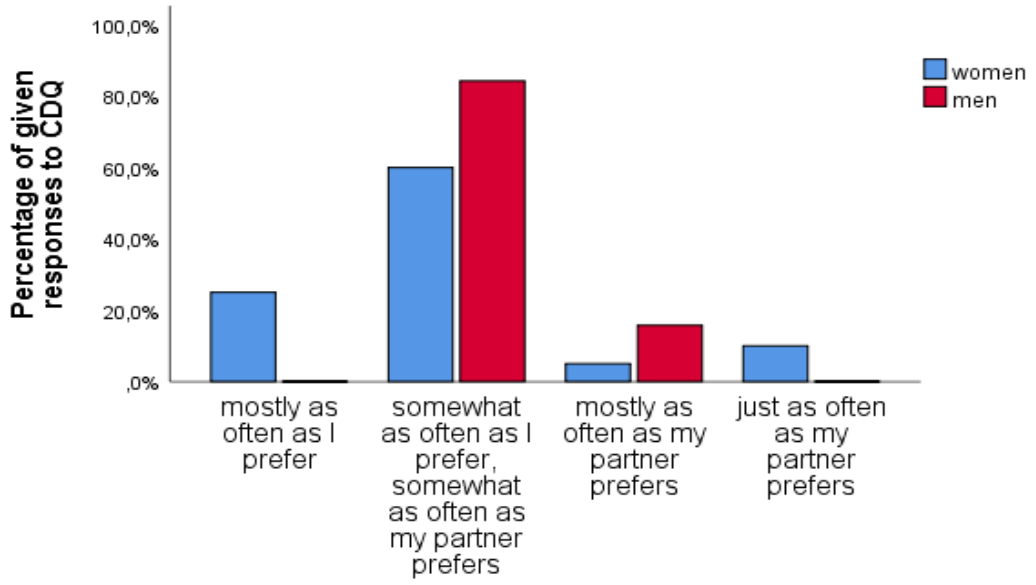

Figure 56: It shows the percentage sexual differences in completing work together. No statistical differences are detectable.

To investigate the effects of dominance/subordination on individual hormone secretion patterns, we performed a Spearman correlation between the mean values of cortisol and testosterone levels of women and men and CDA scores, respectively. There was no significant correlation between women` cortisol (*r= -0.20, p= 0.38*) and testosterone levels (*r= -0.34, p=0.13)* and their CDA scores (Figure 8, 9).

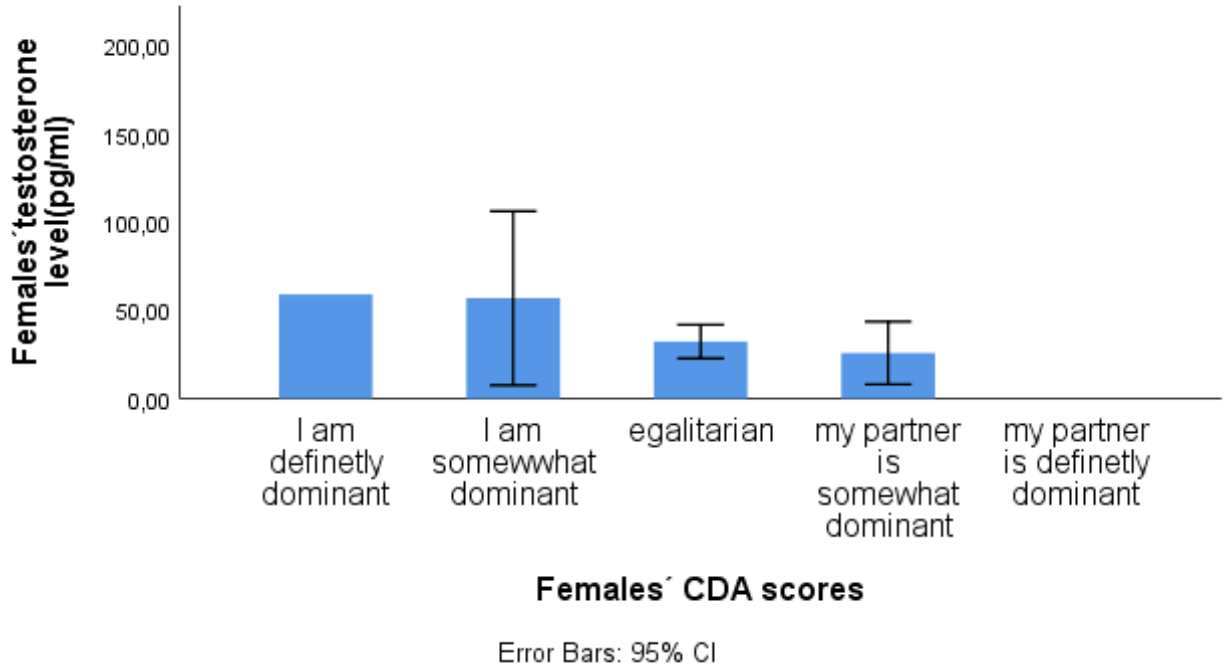

Figure 57: The association between female partner´s Couple Dominance Assessment (CDA) scores and their mean testosterone levels. Indicate that the concentration showed no significant differences. Values are mean (± SD). No error bars are represented for the first and last bars due to insufficient data.

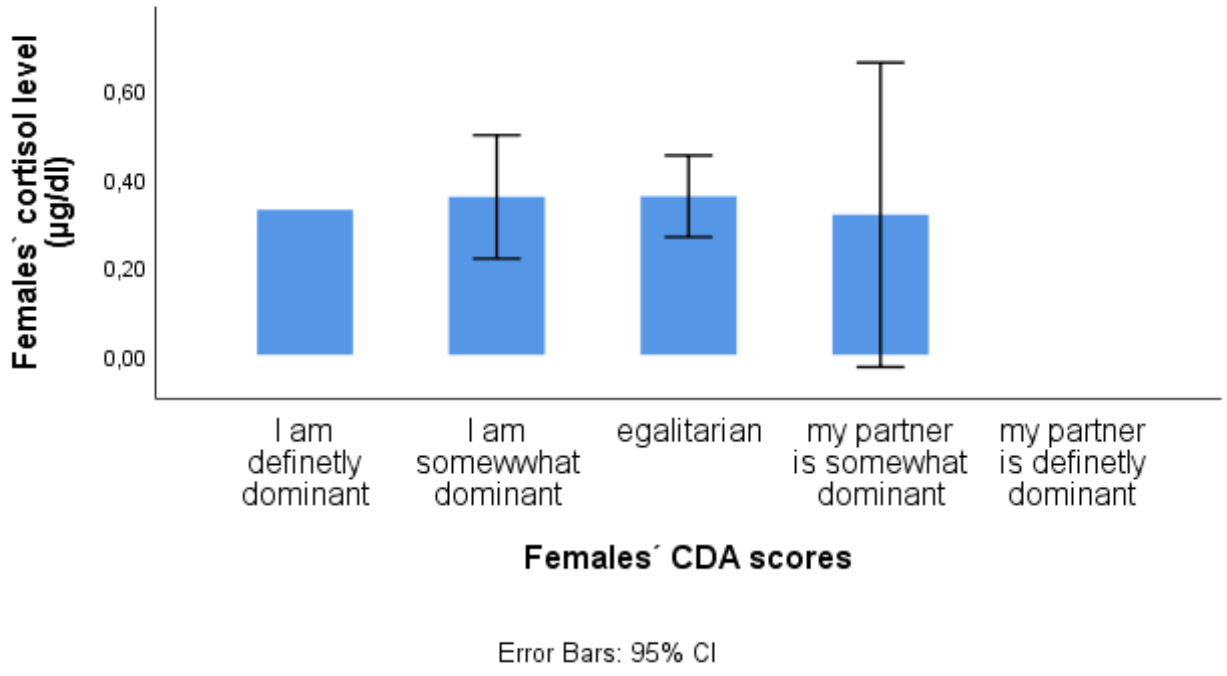

Figure 58: The association between female partner´s Couple Dominance Assessment (CDA) scores and their mean cortisol levels. Indicate that the concentration showed no significant differences. Values are mean (± SD). No error bars are represented for the first and last bars due to insufficient data.

Finally, a significant negative correlation was revealed between men´ cortisol (*r= -0.47, r= 0.03*), not testosterone levels (*r= -0.84, p= 0.72*) (Figure 10, 11).

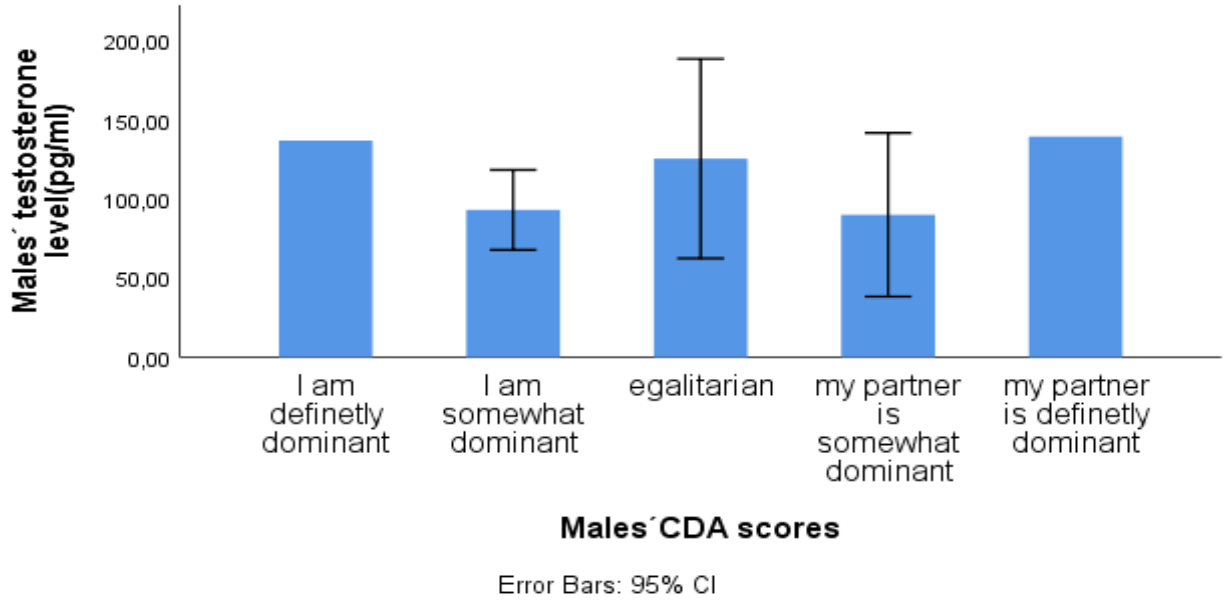

Figure 59. The association between male partner´s Couple Dominance Assessment (CDA) scores and their mean testosterone levels. The differences are statistically not significant. Values are mean (± SD). No error bars are represented for the first and last bars due to insufficient data.

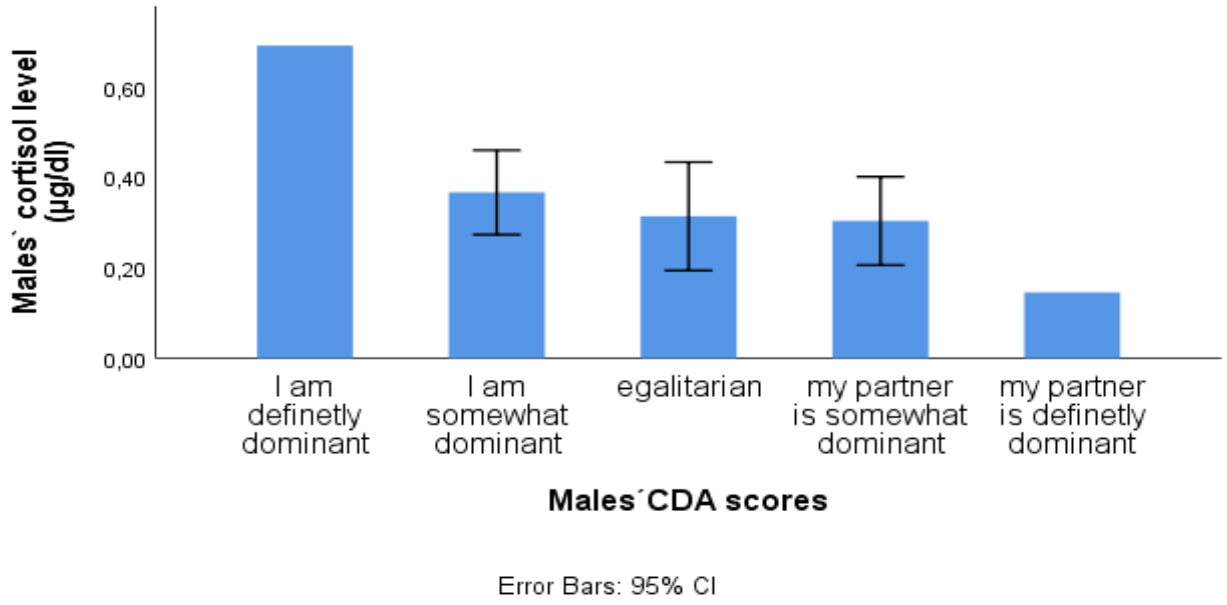

Figure 60. The association between male partner´s Couple Dominance Assessment (CDA) scores and their mean cortisol levels. A negative significant correlation was found between males´ cortisol levels and their CDA scores (*r= -0.47, r= 0.03).* Values are mean (± SD). No error bars are represented for the first and last bars due to insufficient data.

4. Discussion

The aim of the present study was to examine the effects of dominance characteristics on relationship functioning and endocrinological responses in romantic couples. A direct single-item self-report (the CDA) was used to assess couple dominance. CDA reports showed that approximately 57% of the couples reported that they or their partner were somewhat dominant (weak dominance), 35% of them reported that neither partner was dominant (egalitarian), while approximately 8% of them reported that they or their partner were definitely dominant (strong dominant) in the current relationship. These results support our predictions arguing that dominance may an adaptive strategy to reduce the cost of conflict between partners (Jozifkova et al., 2014). However, one reasonable question should be asked why the majority of the couples reported having weak dominance instead strong dominance. This finding may be explained by considering that our participants were mostly young dating couples. In westernized societies among young couples, there is a shifting from clear-cut dominance towards to more egalitarian romantic relationship compared to older married couples (Galliher et al., 1999). The reason for this could be that both partners have equal access to educational and economic resources (hence all are students), which allows allocation of emotional resources and decision-making power. In addition to the partner´s age, having either a short-term or a long-term relationship might also be expected to account for the differences in dominance strategy in relationships. Accordingly, Ponzi and colleagues (2015) proposed that perceived egalitarianism is a characteristic of early stage relationships especially for younger people who do not share their resources the way older couples do. Therefore, longitudinal and comparative investigations are needed to clarify whether the dominance hierarchy is an adaptive strategy between partners. Although the majority of the participants perceived their relationship having weak dominance, among couples there was no agreement between the two partners who was dominant in the relationship.

Additionally, participants also answered a 40-item self-report questionnaire (the CDQ) regarding asymmetries in decision-making. A factor analysis identified five factors, which we labeled level of argument (Factor 1), emotion and partner issues (Factor 2), chilling (Factor 3), existential issues (Factor 4), and socializing (Factor 5). None of these five factors was correlated to the CDA scores. Thus, the assessment of dominance did not reliably reflect the asymmetries in decision-making power in many aspects of the relationship. This has made it difficult to establish

our prediction as to whether the presence of dominance may have an effect on the relationship functioning. One limitation factor regarding the assessment of this prediction is the problem of measurement. In their comprehensive review, Gray and Burks (1983) suggested that recent studies on couples` decision-making structure should attempt to avoid "the problem of socially desirable responding", since the measurements are most frequently based on self-reports. Although this study used more than one device to assess dominance "objectively", we could not detect an agreement in the dominance classifications between couples. To get reliable outcomes in order to elicit our understanding regarding the dominance strategies in couples, future studies should develop new assessment rather than self-reports.

Past studies has been consistent in suggesting that symmetrical/asymmetrical power structure in close relationship are related to sex differences. The general finding was if relationships are perceived as unequal both partners typically report the male is more dominant, regardless of age (Ponzi et al. 2015; Oyamot et al., 2010; Fablo & Peplau, 1980). Furthermore, to understand sex differences in reproductive physiology and behavior in humans a focus on evolutionary processes is necessary (Luxen, 2005; Boehm, 1999; Jozifkova et al., 2014). However, in contrast to previous reported findings on sex differences in dominance, we did not find any sex differences. Nevertheless, males showed greater variation in rating dominance than females.

An extensive literature proposed that threats to social status in dominance hierarchies elicit HPA axis (Dickerson & Kemeny, 2004; Siart et al., 2016; Campbell et al., 2019; Virgin & Sapolsky, 1997). Therefore, it is well known that testosterone and cortisol responses provides a particularly valuable means of evaluating submissiveness and dominance. Our analyses examining dominance/subordination on individual hormone secretion patterns yielded that males reporting themselves more dominant had higher cortisol levels, but not testosterone. We observed no relationship between female hormone responses and level of dominance. Although there is considerable support that in many species testosterone correlates positively with aspects of dominance and cortisol has been linked to avoidance and submissive behaviors. However, recent studies suggested that such mentioned endocrine features do not mark all individuals in a group (Sapolsky, 2004). Because endocrine profiles vary considerably and therefore, reflecting individual differences (Liening & Joseph, 2010; Maner et al., 2008; Virgin & Sapolsky, 1997). Abbott et al. (2003) suggests that in primates´ social systems, there are different variables that may contribute to abovementioned individual differences in dominance strategy in relation to stress responses such

as whether the hierarchy is stable or unpredictable, the frequency of physical/social stressors, the availability of social support. Additionally, Pflüger et al. (2016) found that a polymorphism of the human COMT gene affects individuals´ dominance strategy in Japanese macaques, a despotic primate society. Therefore, it can be assumed that behavioral and endocrine parameters regarding dominance may be related to genetic predisposition.

It has been also argued that not all stressors would be capable of triggering particular physiological responses. In their meta-analysis, Dickerson and Kemeny (2004) showed that certain type of stressors with specific characteristic lead to cortisol elevations. Hence, further research is needed to investigate whether the nature of the stressor have an effect on causing physiological responses.

In respect to interaction between dominance/subordination and hormone secretion, there might be a large variety of factors that may account for the differences in testosterone and cortisol levels (eating food or drinking caffeinated beverages, exercising, or smoking prior to revealing salivary samples etc.) (Maner et al., 2008; Anders & Goldey, 2010). Although, we determined a specific period of time (between 8 am -10 am) for the revealing of saliva samples in order to avoid daily fluctuations in hormone levels, we did not control for other activities/factors that are known to affect hormone levels. Furthermore, in a recent study, Mehta and Prasad (2015) submitted the dual-hormone hypothesis positing that testosterone is related to dominant behavior only among individuals with low level of cortisol. Previous studies also suggest that other hormones should also examined to determine whether they interact with testosterone and cortisol to shape social behavior such dominance. (Maner et al., 2008; Mehta & Prasad, 2015) Notably, further investigations are required to draw a more comprehensive picture of endocrinological outcomes of dominance/subordination in human couples.

Although primate studies allow us to evaluate human social behavior such as dominance, in most nonhuman primate species, hierarchy is maintained through aggressive displays by dominants. However, humans might have developed diverse psychological responses to threats to one´s dominance. Thus, the transition from nonhuman to human subjects might be difficult. Humans' perception as to hierarchical ranking might involve various factors and complexity (Sapolsky, 2004).

Lastly, another limitation regarding the current study should be noted. Our sample was too small to provide particular outcomes about the relationship between dominance/subordination and relationship functioning as well as physiology in couples. However, we consider these findings to be preliminary and hope to stimulate research to clarify effects of dominance in romantic couples.

In conclusion, we provide new information about the dominance strategies in romantic couples. Our analysis of symmetries/asymmetries in decision-making authority represents an important step towards understanding the behavioral and physiological effects of being dominant or subordinate in a dyadic relationship.

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