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“Add me because I rock”:  
Sex differences in the use of Facebook

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“I think that people just have this core desire to express who they are.  
- And I think that’s always existed.”

Zuckerberg, Mark (CEO Facebook Inc.)

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## Table of Contents

<b>1 Abbreviations .....</b>	<b>1</b>
<b>2 Abstract .....</b>	<b>2</b>
<b>3 Zusammenfassung.....</b>	<b>4</b>
<b>4 Introduction .....</b>	<b>6</b>
4.1 Web 2.0 .....	6
4.2 Communication .....	7
4.3 Friendship .....	8
4.4 Social network sites.....	9
4.5 Facebook .....	11
4.6 Self-presentation & sexual selection.....	13
4.7 Social interaction & parental investment.....	14
4.8 Study objectives.....	17
<b>5 Material &amp; Methods .....</b>	<b>18</b>
5.1 Material.....	18
5.1.1 <i>Distribution</i> .....	18
5.1.2 <i>Questionnaire</i> .....	19
5.2 Methods.....	26
<b>6 Results .....</b>	<b>28</b>
6.1 General Data .....	28
6.1.1 <i>Age</i> .....	28
6.1.2 <i>Occupation</i> .....	29
6.1.3 <i>Origin</i> .....	30
6.1.4 <i>Usage</i> .....	31
6.2 Self-presentation .....	32
6.2.1 <i>Profile Picture</i> .....	32
6.2.2 <i>Picture tags</i> .....	35
6.2.3 <i>Relationship status</i> .....	36
6.2.4 <i>“Interested in”</i> .....	38
6.3 Social interaction.....	40
6.3.1 <i>Frequency of posts on own and others Walls/Timelines</i> .....	40
6.3.2 <i>Frequency of private messages and pokes</i> .....	42
6.3.3 <i>Friend-list composition and creation</i> .....	43
<b>7. Discussion .....</b>	<b>51</b>
7.1 General .....	51
7.2 Self-presentation .....	52
7.3 Social Interaction.....	54
7.3 Outlook.....	56
<b>8. Appendix.....</b>	<b>57</b>

8.1 Supplemental Statistics .....	57
8.2 List of figures .....	63
8.3 References.....	65
8.4 Curriculum vitae.....	70
8.5 Eidesstattliche Erklärung .....	75

# 1 Abbreviations

Abbreviated terms	Non-abbreviated terms
CERN	Conseil Européen pour la Recherche Nucléaire
IP Address	Internet protocol address
SD	Standard deviation
SEM	Standard error of the mean
SN	Social Network
SNS	Social Network Sites
WWW	World Wide Web

**Table 1: List of abbreviations**

## 2 Abstract

Current studies in the field of sex differences in the use of social media mainly collect empirical data but rarely describe in-depth biological interpretations for the reasons of the results. Recent publications suggest that Facebook is more than just a social network (due to its unique offline-to-online contact creation), resembling in fact our true self because of an intrinsic social control of the profiles. This study tests different Facebook-specific predictions derived from different evolutionary hypotheses including parental investment theory, postulated by Robert Trivers and sexual selection theory by Charles Darwin, to further interpret the potential sex differences found in the use of Facebook of over 320 individuals. Thus this study aims to test whether men focus indeed on potentially sexual selected traits like physical strength and agility as well as social success in the online environment of Facebook by providing, among others, a coherent self-presentational pattern in addition to an indicative high count of friends as well as picture tags. Further we assay whether women in contrast focus on social interactions and are more restrictive in terms of friend-list compositions, as extrapolations to a more restrictive mate selection, in addition to determining potential differential communicational trends and informational differences like relationship status publications and messaging habits.

The data collection was performed by an open access online questionnaire, which was distributed via broadcast messages of selected international key users among their contacts. Standard features of Facebook like characterization and motivation of the profile picture, number of picture tags, the friend-list, messaging habits as well as demographical data according to the published data set on Facebook and others were acquired. In total this study includes over 320 subjects (50% male & 50% female) focusing on the age group between 21-30 years.

A statistically significant relation of men showing physical skills and social strength/establishment via the integrated features of Facebook in terms of profile picture (8.1% of men vs. 1.9% of women) and number of friends (mean 384.2 for men vs. 308.7 for women) was found; resembling perfect examples of sexual selection and investment traits as described in the literature. Women, in contrast, focused more on social relationships in their profile pictures (7.5% of men vs. 17.5% of women) and were more passive (20% of men vs. 10% of women sent 60% of their contacts a friend-request) as well as restrictive in



creating their friend-list (8.8% of men vs. 1.9% of woman added an unknown person that looked interesting). No actual differences could be found though in the assayed communicative habits (Wall/Timeline posts, private messages) of the participants focusing primarily on western cultures.

Summarizing the results of the study it could be clearly shown that the predictions derived from the sexual investment theory as well as sexual selection theory are indeed reflected in the sex differences in the social media environment of Facebook by known and novel markers like profile picture preferences or number of friends. This confirms earlier studies and provides novel potential for further investigations for marketing solutions (behavioral targeting as well as direct marketing) or scientific large-scale human behavioral studies making use of the vast data collectives provided by Facebook in a commercial and non-commercial way.

### 3 Zusammenfassung

Aktuelle Studien im Bereich der Geschlechterunterschiede in der Anwendung von Social Media Plattformen fokussieren sich auf reine statistische Analysen ihrer gesammelten Daten ohne die genaueren biologischen Hintergründe dieser zu hinterfragen. Eine kürzlich publizierte Arbeiten deuten darauf hin, dass es sich bei Facebook mehr als um ein x-beliebiges soziales Netzwerk handelt (aufgrund dessen einmaliger Offline-zu-Online Kontaktkreierung). Entgegen vieler Erwartungen, stellen dessen Profile anscheinend doch unser wahres selbst dar. Diesen Umstand verdanken wir dem intrinsischen Kontrolleffekt des um Facebook herum aufgebauten sozialen Netzwerks. Die vorliegende Studie testet Facebook-spezifische Vorhersagen basierend auf unterschiedlichen evolutionären Hypothesen wie der parentalen Investment-Theorie, postuliert von Robert Trivers und der Theorie der sexuellen Selektion von Charles Darwin um eventuell auftretende sexuelle Unterschiede in der Nutzung von Facebook von über 320 Teilnehmern zu erklären. Dabei wird evaluiert ob Männer tatsächlich sexuell selektierte Merkmale wie physische Stärke, Agilität und sozialen Erfolg im Umfeld von Facebook preferentiell darstellen, indem sie, unter anderem, eine entsprechende Selbstdarstellung betonen und eine große Anzahl an Freunden sowie Foto-Verlinkungen besitzen. Zudem überprüfen wir ob Frauen soziale Beziehungen in ihrer Selbstdarstellung betonen und deren Freundes-Listen restriktiver erstellt worden sind als von Männern, als Extrapolation einer restriktiveren Partnerwahl nach der parentalen Investmenttheorie. Zusätzlich untersuchen wir potentiell differentielle Trends in der Kommunikation auf Facebook und Unterschiede in der Freigabe von Informationen wie Beziehungsstatus oder Benachrichtigungsvorlieben.

Die Datenaufnahme geschah hierbei via einem open-access Online-Fragenbogen der durch Status-Nachrichten von selektierten internationalen Usern verbreitet wurde. Standard-Features von Facebook wie die Charakterisierung von Profilbildern sowie deren Motivation, Anzahl an Foto-Verlinkungen, die Freundes-Liste, Kommunikationsvorlieben und demografische Daten wurden, den Facebook-Datensätzen entsprechend, erhoben. Die gesamte Studie involviert über 320 Individuen (50% männlich & 50% weiblich) in der Altersgruppe von 21-30 Jahren.

Bei Männern wurde ein statistisch signifikanter Zusammenhang zwischen einer höheren Wahrscheinlichkeit dass diese physische und soziale Stärke

mittels der integrierten Möglichkeiten von Facebook darstellen erkannt. Dies bezieht sich im Detail auf ein entsprechend assoziiertes Profilbild (8.1% der Männer vs. 1.9% der Frauen) und die Anzahl ihrer Freunde (durchschnittlich 384.2 für Männer vs. 308.7 für Frauen) und stellt damit ein perfektes Beispiel für die sexuelle Selektion sowie die parentale Investitionstheorie dar wie sie in der Literatur beschrieben werden. Frauen fokussieren sich hingegen auf die Darstellung sozialen Zusammenhalts in ihren Profilbildern (7.5% der Männer vs. 17.5% der Frauen) und verhalten sich passiv (20% der Männer vs. 10% der Frauen haben selbst 60% ihrer Kontakte eine Freundesanfrage gesendet), selektiv bei der Erstellung ihrer Freundesliste/Facebook Netzwerks (8.8% der Männer vs. 1.9% der Frauen haben unbekannte Personen aus reinem Interesse hinzu gefügt). Überraschenderweise wurden keine geschlechtsspezifischen Unterschiede in der Verwendung der kommunikativen Mittel (Wall/Timeline Einträge, private Nachrichten) entdeckt. Die gesamte Studie bezieht sich überwiegend auf den westlichen Kulturraum.

Zusammenfassend zeigen diese Resultate klar dass die aus der parentalen Investment Theorie und Theorie der sexuellen Selektion hergeleiteten Vorhersagen im Social-Media Umfeld von Facebook wiedergespiegelt werden unter Berücksichtigung bekannter sowie neu angewandter Marker wie bevorzugte Profilbilder oder Anzahl an Freunden.

. Diese Erkenntnis bestätigt vorhergehende Studien und öffnet die Türen für weitere, global, angelegte tiefgreifende Data-Mining Studien und Anwendungen im Bereich des Social Marketings, Behavioral Targeting und nicht zuletzt für die Biologie selbst in denen die kommerziell und nicht-kommerziell genutzten, umfangreichen, Datenbanken von Facebook zur Anwendung gebracht werden.

## 4 Introduction

This section gives a short introduction on social media networks as well as the social and biological background, providing the essential background information on the study.

### 4.1 Web 2.0

The world-wide web (WWW) or Internet as it is more commonly named originates from Tim Berners-Lee's ambitious project in 1989 to build a platform where scientists around the world could easily exchange their data and results without the need of post offices or travelling in person.[1] Since its creation at CERN Institute the world-wide web experienced a multitude of changes and became arguably the most essential tool in modern communication besides language and writing itself. The world-wide web is based on a network of web servers providing decentralized information pathways from the users web browser as interpreting tool via so called domain and "unique" IP-addresses to the hosts server providing the necessary information. Usually this so-called traffic is routed around primary local hotspots to reduce latency of the communication enabling quasi-instant exchange of information like e.g. location data or media across the globe.[2] The first physical basis of this network were the hard-wired telephone networks already present which are nowadays also complemented with additional radio-, satellite- and glass-fibre networks to cope with the massively increased data volume transferred since Samuel F.B. Morse transmitted his first bits of information in 1836 across an electrical telegraph line.[1-4]

Soon after the kick-start of world-wide web to the public in the 1990s easier tools and ways of creating web content were requested and needed by private persons to create personalized web experiences. The accompanied phenomenon was named web 2.0 as it marked a whole rebirth of the original informational and corporate world-wide web. While the term itself was first used in 2003 by the CIO IT-magazine its development started already earlier as more and more tools enabled users to create private content and interact with each other directly on the internet via web-blogs, comments, interactive articles and a primary example of web 2.0 – the so called "Wikis". Moreover,

cumulative webpages were found, where any visitor can alter the content providing massive databases of knowledge as e.g. the online extensive dictionary Wikipedia. By this development, web 2.0 basically marked the beginning of the today more popular term “social media” and setting the baseline for further developments of online social networks.[5-8]

The increasing complexity of the world-wide web as well as its tremendous popularity created the necessity for specialized start-pages from which one could easily access any further information wanted. The user preferences of start-pages differ, though search engines and news pages always resembled highest potential to be used as start pages before they were integrated into the browsers themselves as features.[9-11]

Only very recently, novel developments replaced the popularity of search engines as start-pages, whereas the social network Facebook resembles one of the most important ones. Ten years into the web 2.0 movement, social networks are frequently associated with being a core concept in today's world-wide web.

## **4.2 Communication**

Communication is one of the most important human abilities, which enabled us to create complex social networks. Since humans have lived in cohorts, communicating with others has been a pivotal trait of our race, which ensured our survival and success of adapting to the environment. The necessity for a complex communication environment is also listed as one of the primary aspects, which lead to the development of our hallmark – the brain.[12] Starting from potentially humble roots our communication, whatever manifestation it might had, peaked into the multitude of languages and dialects we face today around the world. Considering the time we spent each day on communicating with other individuals, the importance of this topic and the necessity to understand its development, influence and potentially future aspects.[13, 14]

Communication itself though does not only comprise language, as we know it today, which of course also underwent evolutionary change in many terms. It also comprises non-verbal aspects, which are either willingly or unwillingly used to show our opponent's moods, feelings or more subtle signs, which can also influence the further responses of the partner. These aspects involve, non-

extensively, movements of the facial muscles, hand-signs or even smells, which are usually used in combination with each other granting us with endless varieties and codes to transmit to our peers. In accordance with this, empathy is an essential asset of our modern communication skills needed every day. Yet the most modern form of communication we have today, the internet, largely excludes those non-verbal aspects despite a recent development towards videoconferences.[15-17]

Naturally since the first signs, sounds or smells have been transmitted, misinterpretation had always been a potential issue of mistakes with any form of communication. Therefore, usually a lot of our communication happens in a redundant and self-explanatory way to ensure the recipient decodes the content correctly and unwanted third parties (like other animals or potential contestants) strive towards decoding our messages. Also targeted misinformation in communication has proven to be a evolutionary-selected, useful trait and is still commonly associated with high levels of intelligence as it can easily grant advantages over other individuals.[18, 19]

It has been frequently shown that there are many sex differences in communication in the day-to-day life, allowing us to efficiently identify a potential partner or if necessary disguise our own intentions.[20] These differences have a variety of biological components and uses, which are discussed in detail in chapters 4.6 & 4.7. Communication forms and intentions differ across the human sexes, but on a global scale still show overall similarities despite cultural or epigenetical influences. These general mechanisms ensure that no matter what area we originate, some basic principles in partner selection and interpretation remain the same and can hardly be misinterpreted.[12, 20-23]

## **4.3 Friendship**

For most people friendship is of highest importance to our mental welfare. Multiple definitions exist in literature, as there are several theories about friendship and how or why it evolved in all human societies around the world. One of the theories, the social exchange theory, bases friendship on a prior and continuous bilateral evaluation process of the relationships benefits by providing for example sympathy and empathy, enjoyment of the others company, trust, honesty and other traits like common interests.[24] It has also

been shown that not every friendship is considered equally and only a limited number of “close” friends exist usually.[25, 26] Since it has also been frequently shown that friendship is rated differently by individuals and genders it is hard to find a clear definition of friends.[27-31] This might be even harder for online friendships like in the case of Facebook. Interactions and communication between friends can of course also be ported into any virtual environment but a real-world contact is always considered closest. Yet social network sites in the online environment have always experienced a strong potential on the world-wide web peaking in the well known success story of Facebook. By no means, this website was the first of its kind, but managed to attract its customers due to a variety of special aspects. One interesting result of the phenomenon Facebook is that the term online “friends” had to be redefined since this term experienced an inflationary use in this context. It appears impossible to have a close emotional relationship to over 200, or in extreme cases, 1000 people listed in your Facebook friend-list. Dunbar et al. suggested that the maximum number of a socially interconnected cohesive group only reach up to 100 to 230 individuals at any given time considering the size of the neocortex as the limiting factor.[32] So what is the purpose of collecting more and more contacts peaking into potentially obsessive behavior? The obvious reason might be the mere networking purposes but also its intrinsic social safety effect.[25, 33, 34] Potential additional interpretations of the friend-lists and its composition are tested in this study. Further it has been shown that friendships differ between the sexes in many ways and are not considered fully equal in every trait.[35] Summarizing these facts there is a spectrum of theories on the origin of friendship, only very limited close friendships are realizable at the same time (due to various factors like time investment, mutual interests or emotional binding) and its extrapolation into the virtual social network environment cannot be considered fully comparable to the real-life counterparts.[36-39]

#### **4.4 Social network sites**

Social network sites (SNS) can be considered part of the so-called social media sites where they resemble a special environment in the web 2.0-user experience since they do not focus on presenting content like the amount of others shown by topic in Figure 1. More likely, those SNS focus on representing yourself to an integrated online community by various means. A massive amount of SNS got created so far including dating sites, student

platforms and interest communities. All those sites have in common that they target is to provide a platform for the user to build up and sustain new (business) contacts, friends or partners as well as advertising him-/herself.

## Social Media Landscape



**Figure 1: Social media websites sorted by topic of offers.** Facebook can be found in the social network part alongside of LinkedIn, MySpace and others.

In contrast to other social networks, Facebook is a network where users usually meet each other first in real life rather than only online. This reversed creation of on-line friendships (which still differ from real world friendships in several traits like intensity and others [33]) creates an off-to-online phenomenon which is a unique trait of Facebook.[31, 40] This trait creates the a social controlling feature as well a special kind of interaction situation which leads to an ultimate increase of face-to-face communication in small groups and the incorporated social behaviors on- and offline.[41-43] Other social platforms, like dating sites are more likely to create a para-social interaction where one party knows more about the other one than in return.[44]

Back et al. (2009) states that Facebook profiles closely resemble our true selves more than expected to the previously mentioned intrinsic control.[45] Extrapolating this phenomenon gives raise to the arguable application in

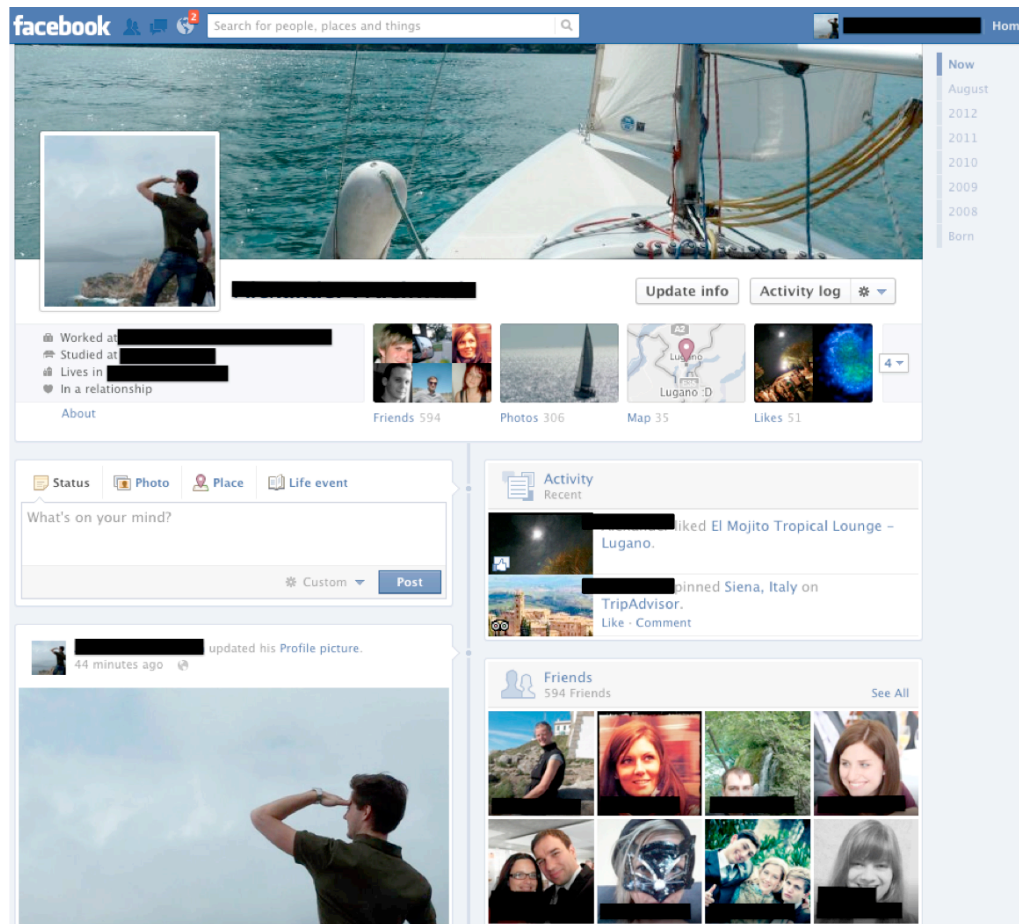


human evolutionary science of Facebook profiles and potentially other social media websites in the world-wide web. Furthermore, certain social interaction features natively associated with sex specific mating strategies could potentially also be observed in the same environment, if the social media networks really reflect actual personalities as suggested. [45, 46]

## 4.5 Facebook

Facebook is a social phenomenon, which invaded and influences and affects modern societies around the globe regardless if single individuals are registered or not in this specific network. Since its humble start in 2004 as a local student network at Harvard University, Facebook reached a member count of over 1 billion users by today, of which almost 50% log in at least once per day. It's estimated value made of 50 billion US \$ made its creator Mark Zuckerberg one of the youngest and most successful entrepreneurs of modern history.[47-51] In 2012, Facebook experienced further increased attention since its introduction at the international stock market, marking one of the biggest entries in financial history. Beside the financial potential, Mark Zuckerberg's social network also provides the biggest resource of so called "social data mining" currently available. The term social data mining refers to the fact that automated data extraction softwares or online surveys allow easy worldwide access to a multitude of public data and a seemingly endless potential to analyze it statistically for specific traits on a global scale. According to a recent article on CNET, Facebook processes approximately more than 500 Terabytes of user data each day including billions of pictures and status updates.[52] Thus Facebook is not only a platform of self-representation to the public, but also a prime communicative tool via its event organization features, integrated messages/shares/status updates and last but not least the famous "like"-button by which users express their sympathy with a certain share/topic or group. Especially this button makes it easy for Facebook and potential third party companies to identify interests and efficiently target their personalized advertisements for users.

Figure 2 shows a typical Facebook user profile page (in the current "Timeline" design) as viewed by the user.



**Figure 2: Representative of a Facebook user profile** as viewed in its current design “Timeline”. The header of the page comprises the users profile picture (left), a broad “cover photo” for personalization (middle) and links to certain time points (right). Basic information like age, education, occupation and the relationship status can be found below in addition to number of friends, number of pictures and “likes” as primary spotlights/self presenting features above the actual interactive wall itself.

Besides the ability to produce personalized advertisements, Facebook has always been in the public spotlight for provoking severe privacy issues with accessing user data. This has been due to, intentionally, complex designed setting trees, which by default publish a variety of data and could only be changed by investing a noticeable amount of time. In general, social networks understandably are always walking the line between forcing their users to provide a basic set of data to justify their platform and holding sensitive data back to counteract potential misuse of it. Facebook and other websites have been subject for this discussions simply because of their mass popularity and thus potential danger on a global scale.[53, 54]

Beside the controversial discussions of privacy issues and the social effect of this network it has been shown by Back et al., as previously mentioned, that

most Facebook profiles, contradicting most expectations, actually reflect the real personality and not self-idealizations of one's own character. [45, 54] According to this a Facebook profile not only resembles parts of information but also one's own reputation, which is difficult to control in a social environment. This fact is based on the controlling and ultimately correcting effect of the surrounding social network and friends on every single post or bit of information in a profile. Since Facebook profiles are virtual mirrors of existing people and their real personalities, it can be expected that these profiles also reflect the human nature, thus its differentiated characteristics of sexual behavior, selection and interactions as discussed below in chapters 4.6 and 4.7. [55]

## **4.6 Self-presentation & sexual selection**

Self-presentation is closely linked to sexual selection and sex differentiated behavior.[46] Diverse sexual behavior can be tracked back to basal motivations, which differ according to the sex. We encounter a sexual selection process throughout all species in that only traits are selected that are potentially beneficial for the survival of the offspring. The theory of sexual selection is a direct inference of the inclusive fitness theory describing the overall fitness of a species or cohort and that only beneficial traits to such will be kept in the population and selected for. The sexual selection theory indicates that certain physical and social traits lead to a higher likelihood of mating with the selecting gender (for mammals usually the female sex as it has a higher investment into its gametes, thus a higher risk to lose more energy by mating with a potentially weak partner). These traits include physical fitness, social security and success as well as others. This might be slightly influenced by the surrounding social system of the species or in the case of humans by culture but always remained of essential importance in every part of our lives (potentially even the virtual one of Facebook like assayed in this study).[56, 57] This study extrapolates predictions based on these theories to determine whether men indeed show a focus on potentially sexual selected traits like display of strength and physical ability as well as success in social terms in the boundaries of Facebook.[56, 57, 60-63] Considering this, self-(re)presentation is a pivotal factor to define one's position in society since non-conformal behavior could lead to social punishment.[64] Therefore, it is of great importance for individuals to control the perception of themselves in public. According to this, self-representation can be described as a cite of T.S.

Eliot: "We put on a face to meet the faces we meet." [65] It is this "information management game" that defines ourselves. On social network sites, information control is made easier than in real life. The picture that we create of our self is still controlled by the community since Facebook in particular resembles a special case among the social network sites where contacts are usually first met offline and then added online. This creates a controlling environment where the information provided online mostly resembles the real life equivalents. [66] Also narcissism plays an important role on social network sites. The self-presentation could be assessed via integrated functionalities of Facebook like the amount of tagged pictures, characterization of the profile picture as well as further motivational questioning and general information provided publicly as suggested in other studies on different social network sites. [65, 67, 68]. The Profile picture presents the most pivotal part of the self-presentation features here since it is outlined in every post or action that is done on Facebook as a signature of the user as well as on the personal page. Picture tags are additional picture of the profile owner, which show up next to the profile picture and additionally identify the user. The user can be tagged on a variety of picture but commonly these show the user him-/herself. The identification can happen by third parties or by the profile owner and potentially show him/her in many situations – usually being more recent than the profile picture. Additionally the picture tags are also frequently used as some kind of picture collection showing previous moments (more or less important) in the users' life. Thus the picture tags are an important factor for the self-representation of the user but also have high impact on the social interactions of him/her with the environment and potentially indicate desirable features like wealth, social security or influence.

## **4.7 Social interaction & parental investment**

Social interaction abilities in the terms of Facebook primarily means the various forms of communication on the platform via text messages on Walls/Timelines, private messages, status updates but also as one of the most important key features the contact list or friend list itself. This list resembles the outcome of the social interactions on Facebook and plays a central role of its functionality since in most cases the data feed provided comes (albeit from paid, sponsored updates) from friends in your contact list. Interestingly though Facebook breaks aforementioned maximum cohort limits of mean 150 contacts apparently with ease in most cases which lead to our suggestion to use it as a marker for social success but also for potential more or less

restrictive contact making. The parental investment theory discussed by Trivers and Krebs describes the fact that the sex making the lower investment in its offspring will fight for the access to the other sex making higher investments among its own gender (intrasexual competition). This is derived from the previously mentioned theory of sexual selection which also ultimately gates back to the well established inclusive fitness theory.[58, 59] In the case of humans this means that the men will fight for access to women to successfully mate and procreate while they will be the selective/more restrictive gender. Further Buss [56] describes that, despite social influences, women will always seek for certain patterns in their partner, which ultimately ensures better progeny and their safe upraising.[46, 60] This study aims to determine whether women indeed show a more restrictive pattern on Facebook by being more restrictive in creating their contact list in terms of total number and admitting access by new contacts.

Further social interactions (especially communication) have shown to display a variety of sex differences in many situations and have to be viewed also in the light of self representation.[12] After all social interactions are altered by the presentation of oneself during the information exchange happening on physical basis by appearance and naturally also on a virtual basis via the exchanged information and the expected reactions of the partner(s).[69-72] Additionally and especially in the online environment, different characteristics of the user play an important role in the actual use of the social interactive features of the website.[73, 74] Moreover, as already mentioned in chapter 4.3 close, Dunbar et al. suggest that the mean maximum number of people being able to exist in a cohesive, direct social group is around 150 individuals indicating that also social interactions in Facebook (where friend counts above this number are not rare) potentially follow specific rules.[32] In terms of Facebook, social interactions mainly happen between people who were already met offline though how close or useful the majority of these friendships are is still a matter of discussion. The actual use of the social interactive features of Facebook depends not solely sex differences but also on personal characteristics of the user like shyness, narcissism and so on, adding countless variables.[75] It can be projected though that friend-list compositions significantly differs between men and women, as men are expected to be more outgoing (though still depending on character composition of the "Big Five" like openness, conscientiousness, extraversion, agreeableness and neuroticism according to Ross et al., 2009 [76, 77]). Thus social interaction in the Facebook environment should potentially show similar sex differences like in the real world if we consider it to be a true

mirror of ourselves. Naturally sexual selection traits then also play a role in the altering of sexual interaction as already postulated in the literature.[22, 23] Nevertheless to receive a reliable and consistent picture, the social interactions are defined in this study by general communication behavior via the so-called “wall” or private messaging services which are already integrated in Facebook. Further, the composition of the friend list in terms of total number, invitation habits and gender distribution is assessed as well as general frequency of the use of Facebook like suggested in a variety of studies.[44, 66, 73, 76]

## 4.8 Study objectives

Summarizing, this study aims to clarify whether selected predictions derived from the sexual selection theory and sexual investment theory can be applied and verified in the virtual social environment of Facebook.

In particular we tested whether a male focus on potentially sexual selected traits like physical strength/agility and social success in the online environment of Facebook exists by providing a coherent self-presentational pattern of such, among others, in terms of a profile picture in addition to an indicative high count of friends as well as picture tags.

Further we assayed whether women in contrast focus on social interactions and are more restrictive in terms of friend-list compositions and providing relationship information to the public, as an extrapolation to a more restrictive mate selection, in addition to determining potential differential communicational trends.

Additional parameters like geographic location, relationship status, occupation, etc. are also collected to achieve a complete picture and search for further differences.

Assessing those sex differences in the use of Facebook regarding self-representation and social interactions is achieved by using a questionnaire and assessing the following factors:

- General demographic data (e.g. age, sex, occupation)
- Self-representation in Facebook (i.e. profile picture, picture tags, motivations)
- Social interactions in Facebook (e.g. use of Timeline/Walls, private messages, friend-list composition)

The core hypothesis that Facebook resembles our true selves, as stated by Back et al., 2009 [45], which provides the basis for the rationale that predicted sex differences, as mentioned above should, indeed be able to be identified online.

## 5 Material & Methods

This study was performed via an anonymous online survey without recording user IP-addresses, Facebook account data or other associated personal data other than the responses to the questionnaire shown in Chapter 6.. Users were informed about the usage of their data using an initial invitation message as well as directly noted on the study survey and in the corresponding Facebook group. This study was performed according to the current Austrian law and the corresponding rights of the test subjects between February and July 2012.

### 5.1 Material

This section gives an overview of the questionnaire used for this study as well as additional materials used for its distribution.

#### 5.1.1 Distribution

The online questionnaire was created with free-to-use software of Google documents ([www.docs.google.com](http://www.docs.google.com)) and published via the same system on a temporary private web domain ([www.facebookresearch.info](http://www.facebookresearch.info))

.

The actual questionnaire could thus be accessed from anywhere in private at the following link, without the bias of interviewing the subjects and potentially altering their responses by unwanted subconscious influences.

[www.facebookresearch.info](http://www.facebookresearch.info)

After using in-app features of Google documents to monitor a first feasibility test phase of 25 responses (data not shown) the questionnaire was revised and published on Facebook via private message to selected active users on different continents, via status updates of the author on 3 consecutive days, reposts from 3rd party users on a voluntary basis as well as via a corresponding open Facebook group to have estimates of contacted subjects



prior analysis of the obtained data set (data not shown due to user privacy agreement). This procedure allowed a decentralized world-wide distribution of the online questionnaire.

### **5.1.2 Questionnaire**

Below the actual questionnaire can be found, as published on the website. Please note that it was divided into 3 different subpages. Text sizes, formatting and colors may showed minor differences on the webpage – however, a plain and simple design was chosen. Some questions contained explaining sub-comments for easier understanding. On each page all questions had to be answered before being able to proceed to the next page or finally submitting the responses to the database and were thus marked with a red asterisk.

**Page1:**

### **Questionnaire about your Facebook**

Thank you for helping me collecting completely ANONYMOUS DATA.  
NO names or IP addresses will be associated with the data.  
NO login data will be collected or asked for.

It is pivotal that you please fill out the 20 questions below

ACCORDING TO YOUR DATA PUBLISHED ON FACEBOOK.

Thank you for helping me creating this study!

#### **Part 1 of 3: General Data**

1) What is your Age? \*

-Scale from below 10 to over 61 and “not published on Facebook”-

2) What is your Sex? \*

Please indicate also if you haven't published it on Facebook.

- ☐ male
- ☐ female

3) What is your Profession? \*

- ☐ not published on Facebook
- ☐ Student
- ☐ permanently employed
- ☐ Internship/ temporary employment
- ☐ unemployed

4) What is your continent of origin? \*

- ☐ not published on Facebook
- ☐ Europe
- ☐ Asia
- ☐ America
- ☐ Africa
- ☐ Australia

5) What is your Relationship status? \*

- ☐ not published on Facebook
- ☐ single
- ☐ in a relationship

**Page 2:**

**Part 2 of 3: Use of Facebook**

**Your are almost done!**

6) How often do you use Facebook? \*

- ☐ >1 times each DAY
- ☐ 1 time per DAY
- ☐ 2-5 times per WEEK
- ☐ 1 time per WEEK
- ☐ <1 time per WEEK

7) In how many pictures are you tagged? \*

-“open box”-

8) What are you interested in? \*

according to your Facebook category question

- ☐ not published on Facebook
- ☐ men
- ☐ women
- ☐ both

9) Please characterize your current profile picture? \*

What of the categories fits best

- ☐ overhead shot "MySpace shot"
- ☐ alone
- ☐ flirting with the camera
- ☐ showing your own body
- ☐ together with friends / partner / someone I know or like
- ☐ other (no humans on the picture or not myself)

10) Why did you choose this picture? \*

Choose what fits best

- ☐ ... looks attractive
- ☐ ... shows an activity of me
- ☐ ... shows my friendship / family / romantic relationship
- ☐ ... shows an achievement of me
- ☐ ... represents an opinion or attitude

11) How often do you post/comment on your own wall? \*

- ☐ >1 times each DAY
- ☐ 1 time per DAY
- ☐ 2-5 times per WEEK
- ☐ 1 time per WEEK
- ☐ <1 time per WEEK

12) How often do you post/comment on the wall of others? \*

- ☐ >1 times each DAY
- ☐ 1 time per DAY
- ☐ 2-5 times per WEEK
- ☐ 1 time per WEEK
- ☐ <1 time per WEEK

13) How often do use the private messages? \*

- ☐ >1 times each DAY
- ☐ 1 time per DAY
- ☐ 2-5 times per WEEK
- ☐ 1 time per WEEK
- ☐ <1 time per WEEK

14) How often do use the "Poke" feature? \*

- ☐ >1 times each DAY
- ☐ 1 time per DAY
- ☐ 2-5 times per WEEK
- ☐ 1 time per WEEK
- ☐ <1 time per WEEK

**Part 3 of 3: Your friend list**  
**...the last few questions**

15) How many Facebook friends do you have? \*

“open box”

16) How many of your Facebook friends are MALE? \*

Check your friend list and make an educated guess.

- 100%
- 80%
- 60%
- 50%
- 40%
- 20%
- <20%

17) How many of your Facebook friends are FEMALE? \*

Check your friend list and make an educated guess.

- 100%
- 80%
- 60%
- 50%
- 40%
- 20%
- <20%

18) How many of these Facebook friends DID YOU INVITE? \*

How many did you actively send an invite.

- ☐ 100%
- ☐ 80%
- ☐ 60%
- ☐ 50%
- ☐ 40%
- ☐ 20%
- ☐ <20%

19) How many of these Facebook friends INVITED YOU? \*

How many sent you an invite to accept.

- ☐ 100%
- ☐ 80%
- ☐ 60%
- ☐ 50%
- ☐ 40%
- ☐ 20%
- ☐ <20%

20) Summarizing your friend list - Who did you add? \*

- ☐ only close friends / family / my partner
- ☐ any friend
- ☐ anyone I met a couple of times
- ☐ anyone who looks interesting
- ☐ anyone who wants

## 5.2 Methods

The survey was sent out to selected users in the Facebook network on different continents, to provide a decentralized data sample of 320 individuals. This sample mainly comprised the age group of 16-40 years old individuals, since this is the main group of active Facebook users. Older users are usually less active and younger users (<16 years) could potentially alter the results. [72, 78] The final sample composition comprises 50% male and 50% female individuals.

The questions asked are divided into 3 basic parts addressing the topics outlined in Chapter 1:

- General data
  - Questions 1-5: Assess general demographic data like sex, origin and age .
- Use of Facebook
  - Questions 6: Indicates general activity of the user on Facebook.
  - Question 7: Assesses matters of omnipresence in the social environment, which could be an indicator for the sexual investment theory. Question 8: Assesses general sexual interest publication in the profile.
  - Question 9 & 10: Assess the self-presentation of the individual in community potentially further comprising stereotypical male or female characteristics of attractiveness and social success.
  - Questions 11 - 14: Assess the social interaction of the user to determine an actively seeking or actively attracting behavior as mentioned above as well as matters of synchronous or asynchronous interaction habits.



- Your Friend list
  - Question 15-17: Assess the social “success” of the Facebook user in terms of total numbers of friends as well as percentage of the opposite sex involved in this list as part of the friend list composition.
  - Question 18 & 19: Assess the social interaction of the user to determine an actively seeking or actively attracting behavior.
  - Question 20: Assesses the general composition of the friend list.

The questionnaire itself can be found in section 5.1.2.

The original database was exported into Microsoft Excel 2011, coded and further statistical analysis and presentation of the data happened via Google documents integrated spread sheet tools, SPSS 20, Microsoft Excel 2011 as well as Graphpad Prism 4.

Statistical tests are performed at a significance level of  $p \leq .05$ . Male and female data sets will be compared via the *Pearson Chi-Square* test for nominal values and *Wilcoxon-Mann-Whitney U-Test* or *Median test* for ordinal values and displayed in crosstabulations with adjusted residuals using SPSS. Adjusted residuals  $>2$  or  $<-2$  were considered significant.[79]

## 6 Results

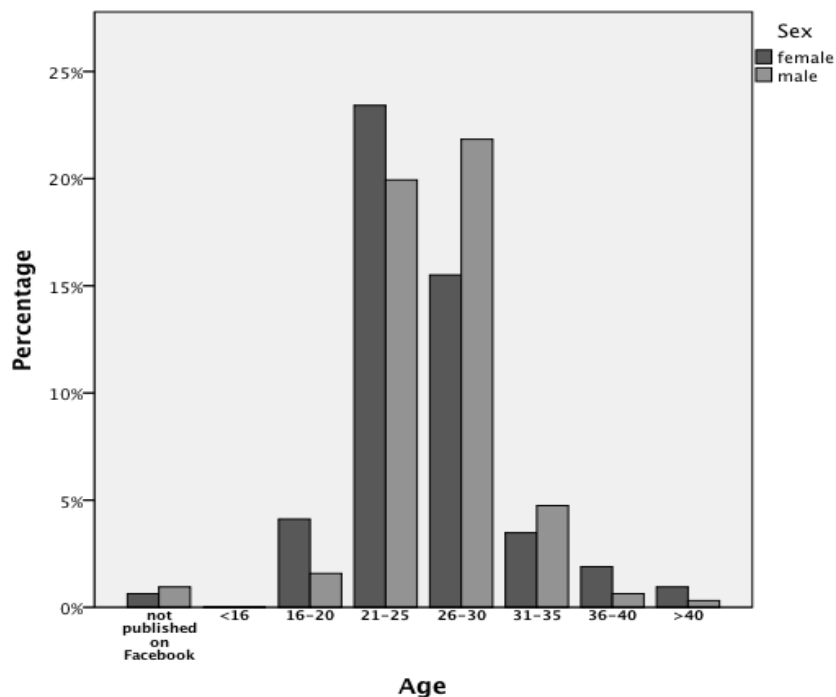
In total 320 questionnaires were filled out, with exactly 50% male and 50% female respondents. In the following section the results are analyzed and visualized according to the structure of the original questionnaire and displayed as percent of total sample (N=320). Additional unmodified exported statistics from SPSS can be found in section 8.1. as supplement to each data-figure.

### 6.1 General Data

This section covers general demographic data acquired during the study to better interpret the results in a social and biological context.

#### 6.1.1 Age

Figure 3 shows the sample composition of the study consisting primarily of men and women between 21-30 years of age (80%).

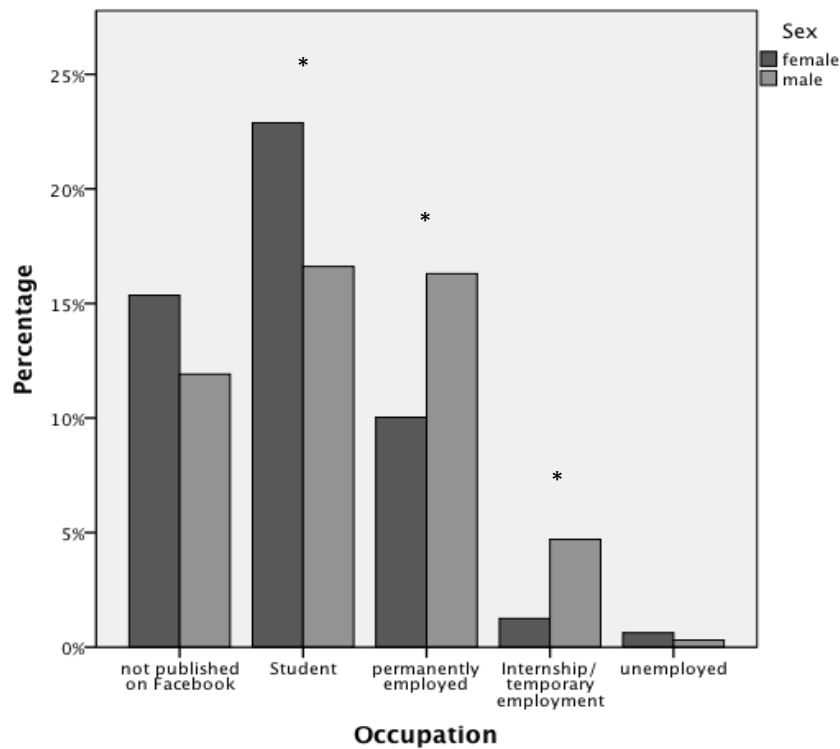


**Figure 3: Relative percentages of age-compositions of the study as compared to the total sample.** Dark grey bars indicate the female distribution of age in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no age or birth date was entered for the public in ones profile page.

No significant difference via the Pearson Chi-Square test could be identified between the sexes,  $\chi^2(6, N=320) = 10.47, p \geq .05$ , thus the study can be primarily considered representative for the age group 21-30. Only a minor fraction (2%) of the subjects did not publish their age/birth date on Facebook, which is indicated in the category “not published on Facebook”.

### 6.1.2 Occupation

The collected occupational data in Figure 4 shows a significant difference between the sexes,  $\chi^2(4, N=320) = 15.70, p \leq .01$ , where men are relatively more frequently employed in the sample in contrast to women, which were still mostly students. *Chi-Square* tests of the overall data are shown in Figure 5 on the right indicating a  $p \leq .05$ , whereas the according crosstabulation is shown in Figure 5 where significantly different cells are identified via their adjusted residual behind higher than 2 or lower then -2.



**Figure 4: Relative percentages of occupations of total sample.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant.

Categories	Females	Males	Chi-Square	df
Not published on Facebook	49 (1.4)	38 (-1.4)	15.70**	4
Student	73 (2.2)	54 (-2.2)		
Permanently employed	32 (-2.5)	52 (2.5)		
Intership/ temporary employment	4 (-2.6)	15 (2.6)		
unemployed	2 (.6)	1 (-.6)		

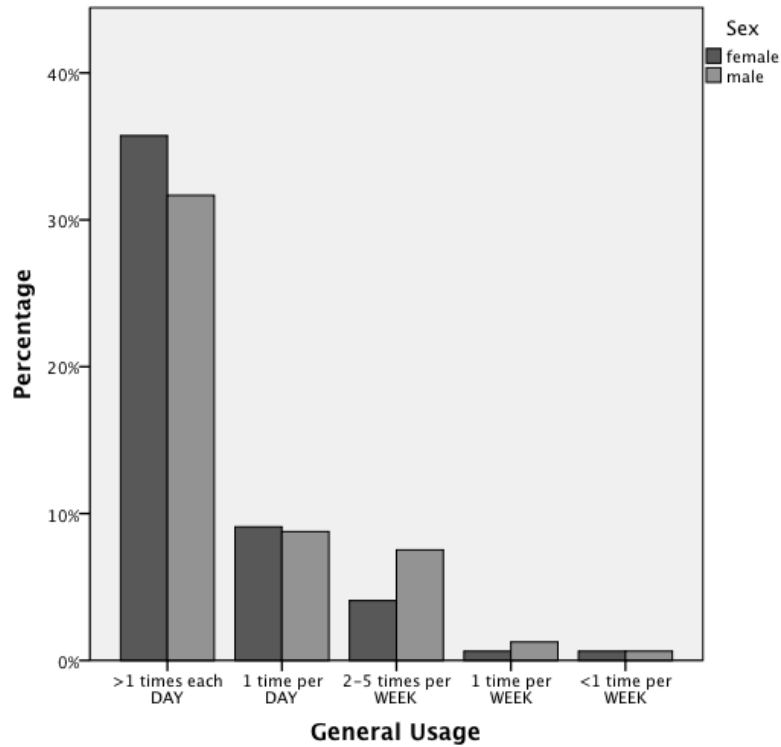
**Figure 5: Crosstabulation of occupations of the study as compared to the total sample.** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants(N=320). \*\* $p \leq .01$

### 6.1.3 Origin

Although a worldwide distribution via users on each continent was used, no equal distribution of origins could be achieved in this study. 63.1% (data not shown) of the subjects were of European origin, which has to taken into account considering potential cultural influences in the self-representation or social interaction assayed throughout this project. No sex difference in this distribution could be measured ,  $\chi^2(4, N=320) = 15.70$ ,  $p \geq .05$ , though providing no further negative impact and thus reassuring the integrity of the data for Western culture area.

#### 6.1.4 Usage

In accordance with Facebook own published data at the sources mentioned previously in the introduction of usage, the majority (68%) of the test subjects used Facebook more than once a day with no striking sex differences,  $\chi^2(5, N=320) = 3.22, p \geq .05$ .(Figure 6)



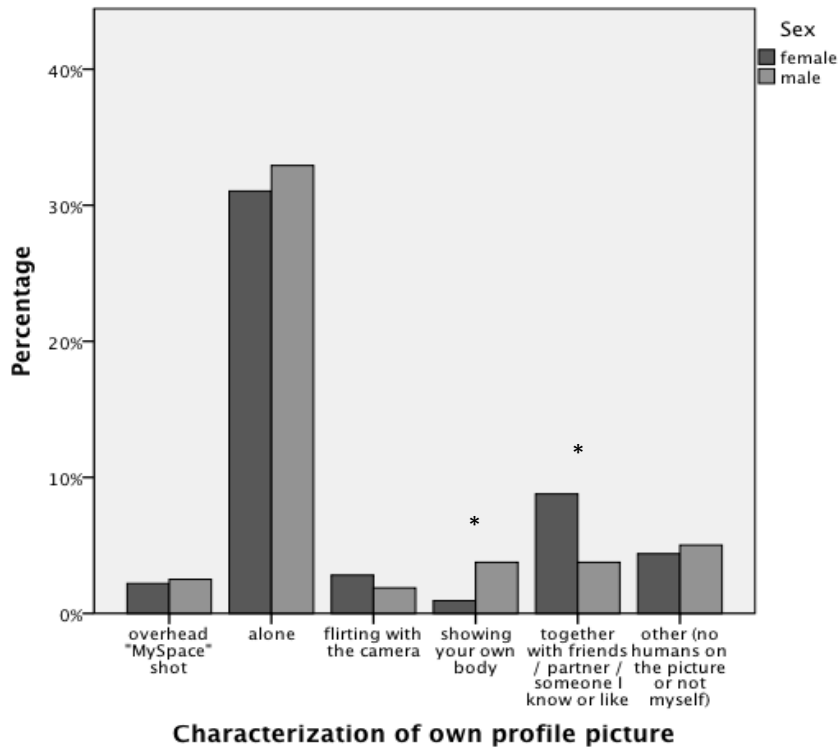
**Figure 6: Relative percentages of general usages patterns of total sample.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. The majority of the Facebook users involved in this study visit the service more than once a day.

## 6.2 Self-presentation

This section of the study dealt with features of Facebook associated primarily with self-representation in the public assaying the profile picture plus it's involved motivations as well as absolute values like number of picture tags or relationship status.

### 6.2.1 Profile Picture

The characterization and interpretation of the profile picture was divided into two different questions to get a clearer idea of the motivation behind this particular and arguably most important mean of self-presentation on Facebook. First a general classification of the currently published picture using six predefined categories was made. Secondly, the subject was asked to classify his or her motivation for choosing this motif. Figure 7 portrays the results of the first part, where a highly significant difference between men and women can be seen. While the majority of the test subjects classified their profile picture as "alone" significant differences could be found. Whereas men are more likely to provide a picture showing their own body, women emphasize a social relationship in their profile picture. ,  $\chi^2(5, N=320) = 13.63, p \leq .05$ . The according statistical analysis is shown in figure 8A.



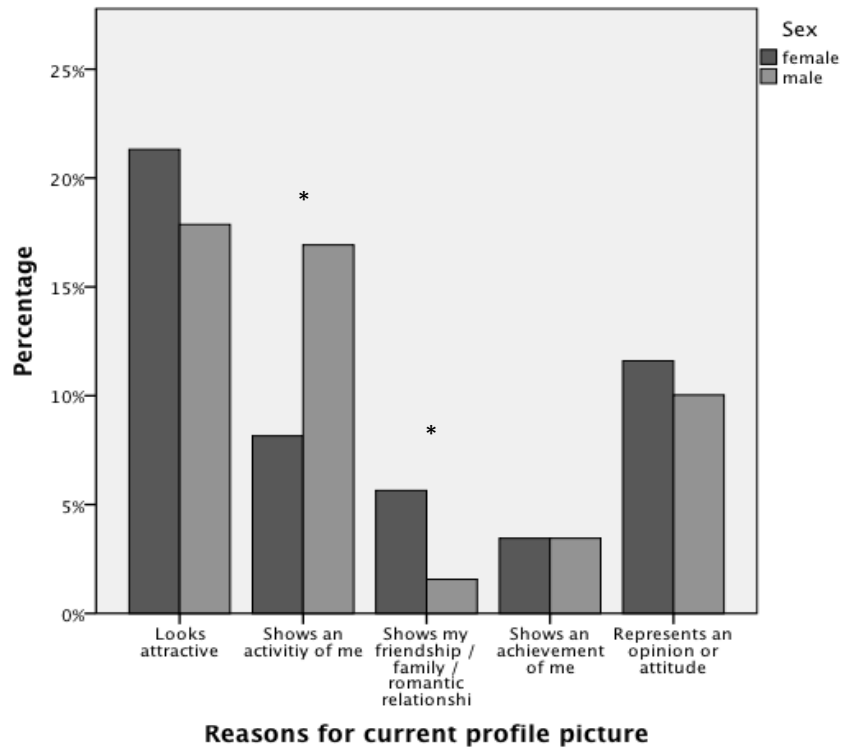
**Figure 7: Characterization of the profile pictures by the users via predefined categories of total sample.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. Men tend to show their own body while women emphasize a social relationship.

The results of the second part of the evaluation of the profile picture are shown in Figure 9. While social interactions, as in the previous question, seem to be a female domain, showing specific activities was significantly enriched in the male population of the sample. This could potentially be linked to the data from Figure 7, where men were more likely to show their own body emphasizing physical abilities and fitness in context with the previously mentioned biological traits. Figure 8B shows the corresponding statistical analysis of Figure 9.

A				
Categories	Females	Males	Chi-Square	df
Overhead “MySpace” shot	7 (-.3)	8 (.3)	13.63*	5
Alone	99 (-.7)	105 (.7)		
Flirting with camera	9 (.8)	6 (-.8)		
Showing your own body	3 (-2.6)	13 (2.6)		
Together with friends/someon e I know or like	28 (2.7)	12 (-2.7)		
Other (no humans on the picture or not myself)	14 (-.4)	16 (.4)		
B				
Categories	Females	Males	Chi-Square	df
Looks attractive	68 (1.3)	57 (-1.3)	18.55***	4
Shows an activity of me	26 (-3.6)	54 (3.6)		
Shows my friendship/ romantic relationship	18 (2.8)	5 (-2.8)		
Shows an achievement of me	11 (-.2)	12 (.2)		
Represents an opinion or attitude	37 (.7)	32 (-.7)		

**Figure 8: (A) Crosstabulation of the characterization of the profile pictures. \*  $p \leq .05$  (B) Crosstabulation of the motives for the profile pictures \*\*\*  $p \leq .001$**  Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants (N=320).





**Figure 9: Motivations for the profile pictures by the users via predefined categories.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. Men are significantly more likely to show a specific activity of them, while women confirm their emphasis on social relationships.

### 6.2.2 Picture tags

In this study the total number of the picture tags was evaluated to have a reliable value, which is directly provided by the system of Facebook to the user and does not have to be subjectively estimated. Due to the unexpected, enormous spread of the numbers visualizations proved to be rather difficult. Instead the detailed statistical analysis is shown in Figure 10. Analyzing these values already indicates a difference between the sexes. These are contradicting each other though since the mean number of picture tags is higher for women ( $M = 303.5$ ,  $SD = 732.78$ ) and lower for men ( $M = 153$ ,  $SD = 329.49$ ) but median values are almost doubled in the male gender in contrast to the female ( $\text{Median}_{\text{female}} = 51.5$ ,  $\text{Median}_{\text{male}} = 96$ ). Looking at the *standard deviation (SD)* and *standard error of the mean (SEM)* it is clear that the female data set struggles with an enormous spread which forces the usage of median values and percentiles to achieve a reliable statement. Doing so the

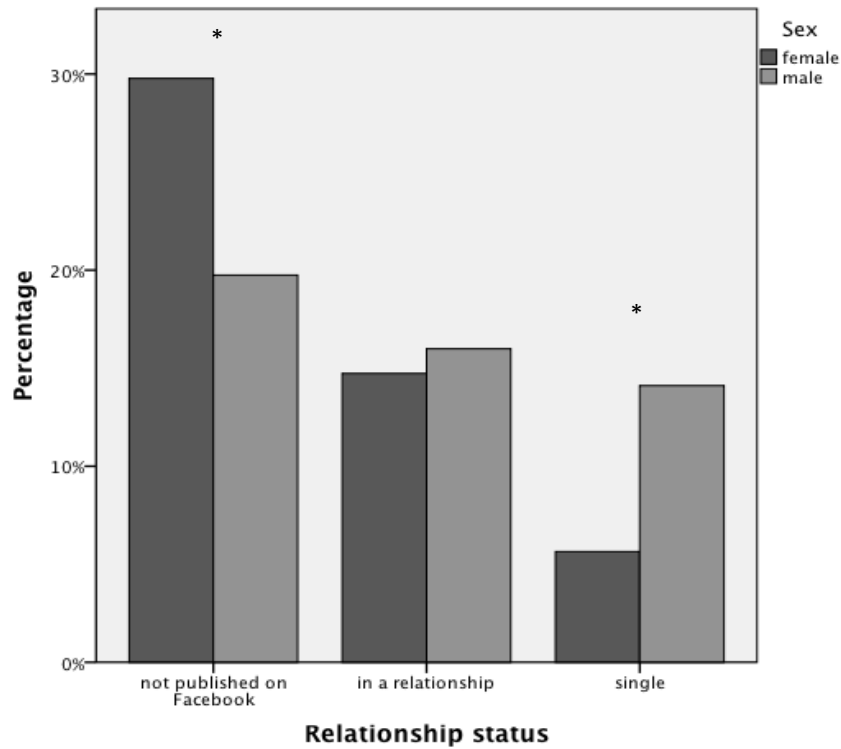
median values were compared in an independent-samples median test resulting in a  $p = 0.117$ . This is below the previously considered significance threshold of  $p \leq .05$  but its potential implications should still be considered since the female data sets had a higher spread thus potentially borderline falsifying and otherwise interesting correlation.

Statistics	Females	Males	Median Test	Mann-Whitney U Test
<b>N</b>	146	153	.117	.081
<b>Mean</b>	303.5	226.1		
<b>SEM</b>	60.65	329.49		
<b>SD</b>	732.78	329.49		
<b>Median</b>	51.5	96		

**Figure 10: Statistical analysis of the absolute Number of picture tags.** Sexes are shown in the columns together with their absolute samples number(N), mean picture tages, standard error of the mean, standard deviation and median value. Independent median test and Mann-Whitney U test on the right show a borderline insignificant correlation between man and more tagged pictures on Facebook. (*Median Test*  $p = .117$ ) / (*Mann-Whitney U Test*  $p = .081$ )

### 6.2.3 Relationship status

The relationship has a distinguished pivotal role in the Facebook network since it was arguable one of the primary ingredients for its success in the student community. The overall experience of the site is not similar to a common dating site, meaning that most times contacts are added after a real-life meeting instead of before. The analysis of the relationship status results are shown in Figure 11, indicating a clear association of men and a higher frequency of publicly stating that they are single,  $\chi^2(2, N=320) = 17.78, p \leq .001$ . Women in contrast only have an increased frequency in not stating anything in the relationship status field of the Facebook profile to the public, while “in a relationship” is equally present in both genders. Figure 12 shows the statistical analysis of Figure 11.



**Figure 11: Relative percentages of the relationship status field options in the sample.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. Men are significantly more likely to show their single status, while women are more likely to provide no information, considering the equal “in a relationship value”, thus hiding a potential single status.

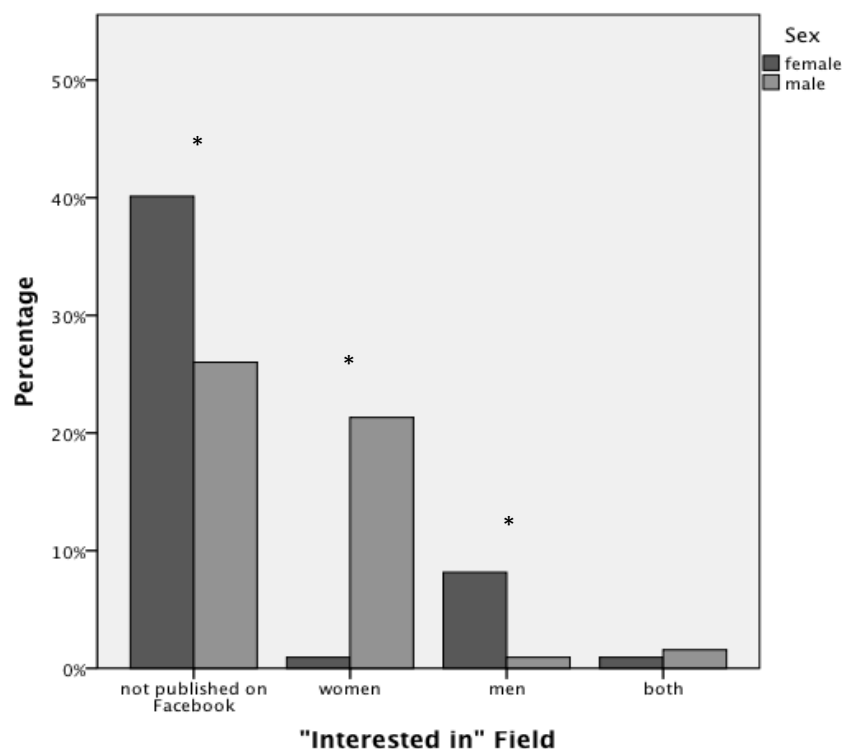
Categories	Females	Males	Chi-Square	df
Not published on Facebook	95 (3.5)	64 (3.5)	17.78***	2
In a relationship	47 (-.5)	51 (.5)		
single	18 (-3.8)	45 (3.8)		

**Figure 12: Crosstabulation of the relationship status field options.** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants(N=320). \*\*\* $p \leq .001$

#### 6.2.4 “Interested in”

The “interested in” field is a way to express ones sexual orientation on Facebook, which has naturally a lot of conflict potential considering persecution of homosexuals in various countries around the globe and is also considered expressing ones open attitude about his or her own sexuality. Figure 13 shows that providing such potentially delicate information to the public can be considered common since a large portion of the test subjects refused to provide this data. Interestingly though, women were significantly more likely to refuse such information. ,  $\chi^2(3, N=320) = 87.38, p \leq .001$

The sexual orientation differences were as expected for the corresponding gender: Men preferring women and vice versa. The corresponding detailed statistical analysis is shown in Figure 14.



**Figure 13: Relative percentages of the “interested in” field options in the sample.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. Men are significantly more likely to show their sexual orientation to the public, while women are more likely to provide no information here.

Categories	Females	Males	Chi-Square	df
<b>Not published on Facebook</b>	128 (5.2)	84 (-5.2)	87.38***	3
<b>Women</b>	3 (-8.7)	68 (8.7)		
<b>Men</b>	26 (4.5)	3 (-4.5)		
<b>both</b>	3 (-.7)	5 (.7)		

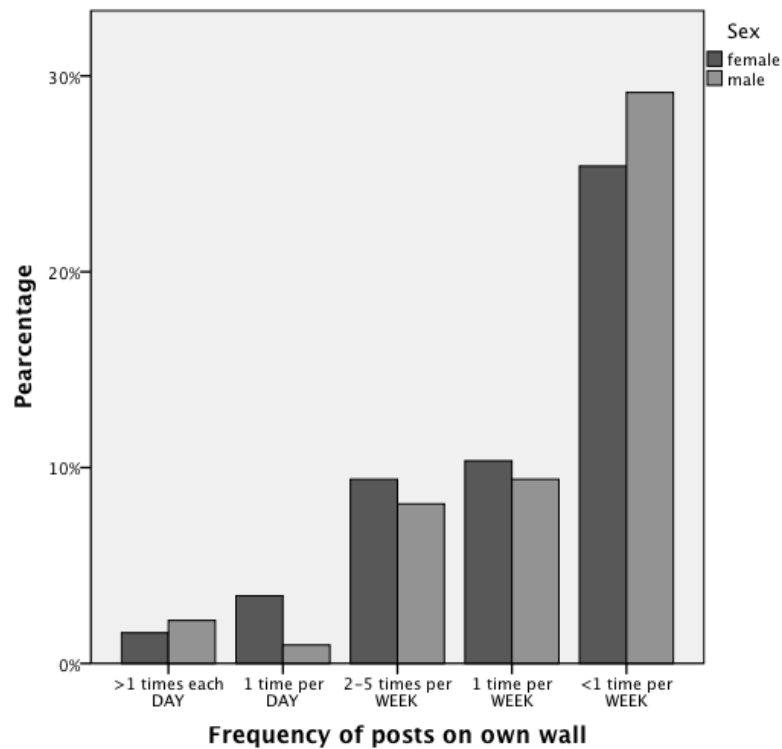
**Figure 14: Crosstabulation of the “interested in” field options..** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants(N=320). \*\*\* $p \leq .001$

## 6.3 Social interaction

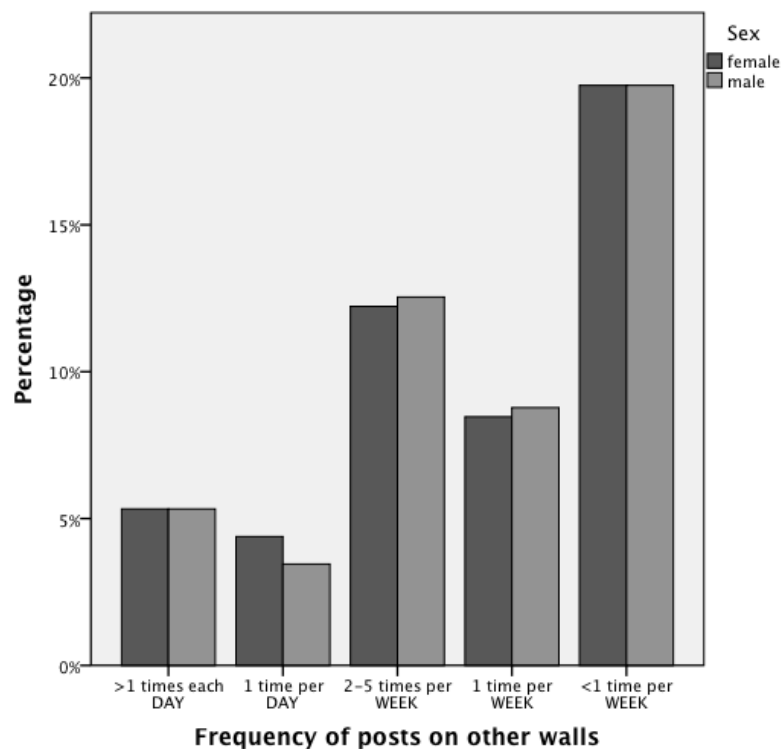
This section focuses on the social interactions features provided by Facebook including Wall/Timeline posts, private messages and detailed analysis of the friend list as the central part of this social network.

### 6.3.1 Frequency of posts on own and others Walls/Timelines

The Wall or Timeline is the most obvious communication feature in the Facebook environment. Here all status updates, pictures, videos, “likes” and other activities are gathered. This information is not always visible to the public but is usually fully accessible to all the directly connected friends of ones profile. Thus it can be regarded as a permanent record where all recent activities are saved or statements (status updates) can be published by the user. Additionally, accepted friends have the possibility to interact with the profile owner there by posting comments on existing records or creating new ones by sharing links or any other message. Due to the previously mentioned semi-public nature of these posts (all other connected friends can see and comment as well on these) this form of indirect communication of Facebook has to be regarded as special kind of “group chat” with all its according public pressure and alterations of the individuals behavior. Since the content of these messages could not be retrieved on a large scale without the users permission, the test subjects were simply asked to state their expected frequency of posting on ones own or any other wall determining introverted or extroverted behavior as well as a more “outgoing”/“seeking” behavior in contrast to an “hosting”/“gathering” behavior. Figure 15 shows no difference in posting frequency on ones own Wall/Timeline,  $\chi^2(4, N=320) = 4.86, p \geq .05$ , nor does Figure 16 show the same categories for postings on other Walls/Timelines,  $\chi^2(4, N=320) = .42, p \geq .05$ . It can be seen that the majority of the tested people post rather rarely on their own or other walls, which as well goes along with Facebook’s own statements that their “Newsfeed” which includes selected Wall entries from other users is dominated by a minority of highly active frequent posters.



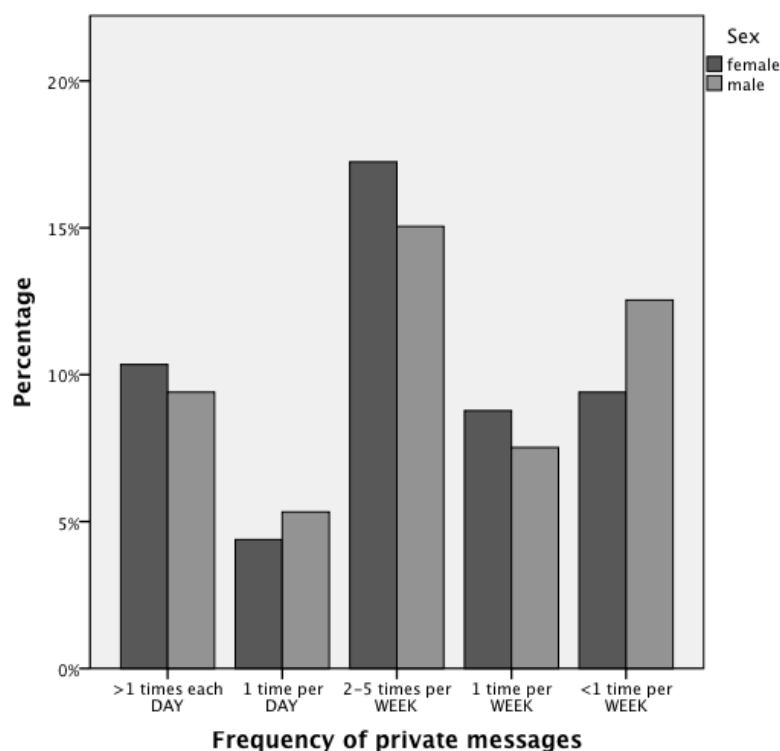
**Figure 15: Relative percentages of the posting frequency on ones own Wall/Timeline.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. No significant differences could be found between the genders here.



**Figure 16: Relative percentages of the posting frequency on other Walls/Timelines.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. No significant differences could be found between the genders here.

### 6.3.2 Frequency of private messages and pokes

Private messages/chats can also be used at Facebook instead of the semi-public Walls/Timeline posts in order to communicate synchronously or asynchronously with other users. It can be expected that this form of messaging is the most frequently used since the information is kept private between the sender and the selected recipients without the ability of other users to read it. Since it is less controlled than the Wall/Timeline less social pressure is experienced here and potential behavioral changes in frequency of use or nature of subjects can be expected by both sexes. This is confirmed by this study in Figure 17.



**Figure 17: Relative percentages of the frequency of private messages.** Dark bars indicate the female distribution in the sample while lighter bars indicate male composition within the study. No significant differences could be found between the genders here.

This form of communication shows no significant differences between men and women could be identified suggesting that the actual communication strategies of the sexes do not differ in the virtual environment.,  $\chi^2(4, N=320) = 2.51, p \geq .05$ .



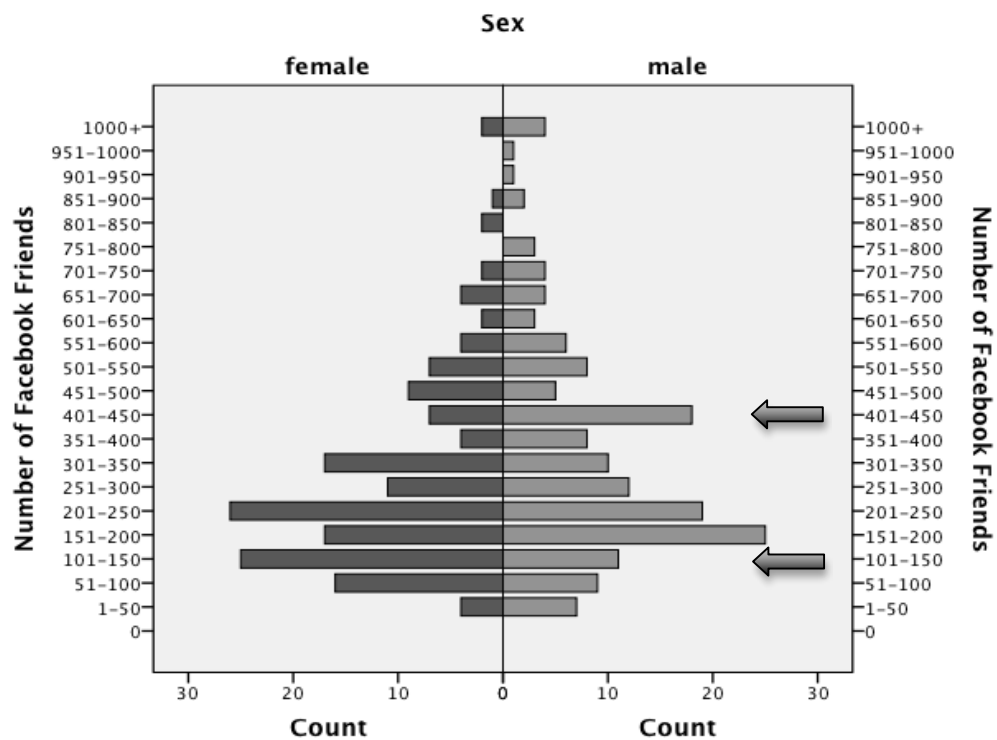
The “poke” feature of Facebook does not have a specific use per se in Facebook and can thus be interpreted in various ways. It provides an interesting way of expressing ones indicate interest in someone without writing him or her a full text message or Wall/Timeline post or simply getting a users attention. Its usefulness and further indications can be argued about but nevertheless it was included in this study to achieve a complete picture of the social interaction forms provided by Facebook. It turned out that around 90% of the study participants do not frequently use this feature (less than 1 time per week) and thus its further impact in the social interactions can be neglected. In addition no significant sex difference in the use of this feature could be detected since it seems to be equally rejected by both sexes,  $\chi^2(4, N=320) = .3, p \geq .05$ , and with relative percentage of 91.9% of subjects using it less than once per week (lowest category asked for).(data not shown)

### **6.3.3 Friend-list composition and creation**

The friend-list is the central feature of Facebook. Here all the gathered contacts appear and are (according to the standard settings) visible to everyone else on the Facebook network with their name, profile and some basic information like sex, date of birth and potential shared contacts as well their total amount of own contacts. While this list is of course the outcome of social interactions and communication in the Facebook community it has be mentioned that it is also reflects a major part of the self-representation of the user and could potentially have important implications for further contact requests or accepts by other users. Thus the friend list is a pivotal part of the Facebook experience and is more than a mere collection of contacts. To analyze this most important feature of the social media environment a total of 6 questions regarding the composition and creation of the friend list were asked in the present survey. This included total amount of friends, subjectively estimated percentage of female and male contacts as well as sent or received invites by other users. Figure 18 shows the statistical analysis of the absolute amount of Facebook friends for each gender. While the distribution spans a wide variety of numbers the mean number of friends for women is significantly lower ( $M=309, SD=257,16$ ) in contrast to those from men ( $M=384, SD=430.9$ ) according to the Mann-Whitney U test.

Statistics	Females	Males	Median Test	Mann-Whitney U Test
N	156	159	.159	.039
Mean	308.7	384.2		
SEM	20.59	34.17		
SD	257.16	430.9		
Median	241	282		

**Figure 18: Statistical analysis of the absolute Number of Facebook friends.** Sexes are shown in the columns together with their absolute samples number(N), mean picture tags, standard error of the mean, standard deviation and median value. Analyzing these values already indicates a difference between the sexes, which was assayed by the Independent median test and Mann-Whitney U test in the center since the SEM values are comparable. While the independent median test results in a significance value of  $p = 0.159$ , the Mann-Whitney U test confirms the significant difference of the mean number of friends of men and women ( $p \leq .05$ ). Thus, on average men have more Facebook friends than women.(N=315) (Median Test  $p = .159$ ) / (Mann-Whitney U Test  $p = .039$ )



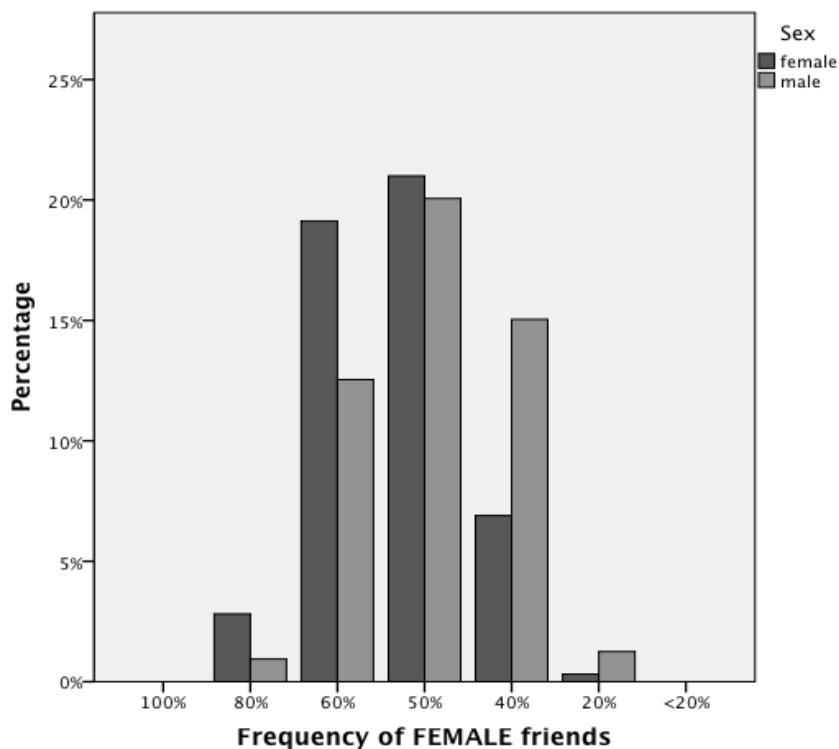
**Figure 19: Frequency of clustered number of Facebook friends.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. Arrows indicate categories of interest for the origin of the differential mean numbers.

As the mean value might not fully represent the true distribution, the data was, post-acquisition, categorized to determine where this significance originates from in detail. The according visualization is shown in Figure 19.

\*

While no statistical analysis was performed here it can be seen that the largest differences \*originate from the clustered groups of 101-150 friends (predominantly female) and 401-450 contacts (predominantly male).

To achieve a more detailed view of the friend list also the general sex composition was assessed in the questionnaire. To do this, a subjective estimation of ones own friend list sex percentages was asked for via six predefined categories. Figure 20 shows the results of these two questions (one for each sex to have an internal control). While the majority of the participants estimated a 50/50 ratio, highly significantly more women stated that 60% of their friend lists would consist of other women. Men instead were more likely to estimate their female percentage to about 40%,  $\chi^2(4, N=320) = 18.85, p \leq .001$ . The same pattern was achieved in the vice versa control (data not shown). The detailed statistical analysis of the significance is shown in Figure 21.

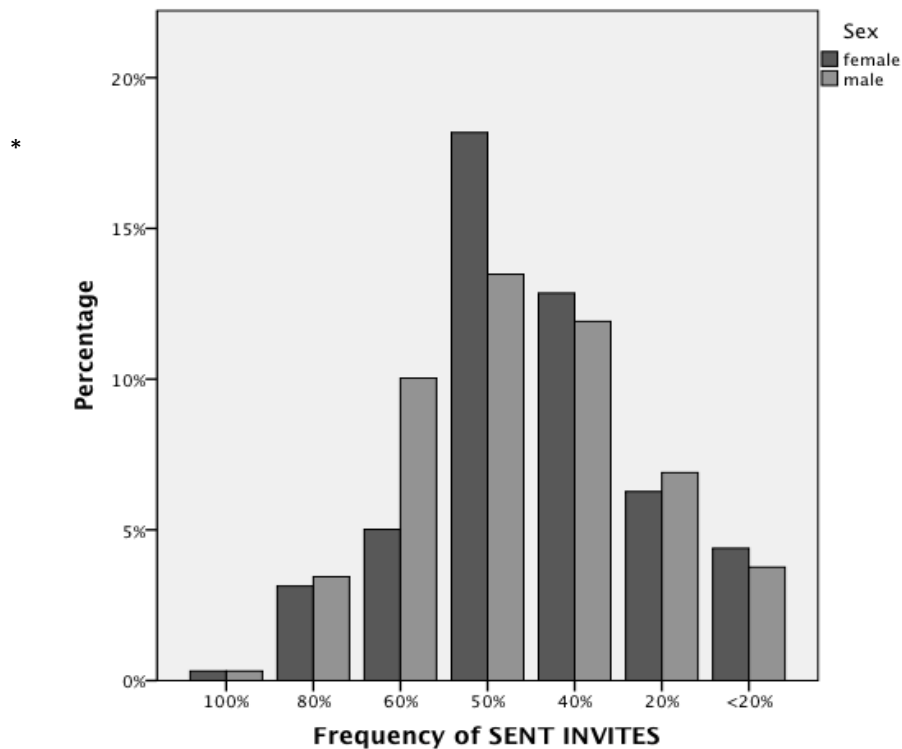


**Figure 20: Relative percentages of the estimated female frequency in ones own friend list.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. While the majority estimated a 1:1 ratio, women were more likely to have 60% female friends as well as men were more likely to have 60% male friends.

Categories	Females	Males	Chi-Square	df
80%	9 (1.8)	3 (-1.8)	18.85***	4
60%	61 (2.5)	40 (-2.5)		
50%	67 (.2)	65 (-.2)		
40%	22 (-3.5)	48 (3.5)		
20%	1 (-1.4)	4 (1.4)		

**Figure 21: Crosstabulation of the frequency of female friends.** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants. (N=320). \*\*\* $p \leq .001$

In order to clarify potential user interactions via the friend list further data about the creation of it was acquired. Users were asked about the frequency of received or actively sent invites. Results of one of these questions are shown in Figure 22, while the control question is left out due to the simple confirming nature of its data and providing security for this study. Statistical analysis via a Chi-Square test of the whole sample data did not show any significant differences.. Yet the adjusted residuals shown in Figure 23 indicate that the difference of these 2 cells in the 60% category is significant.  $\chi^2(6, N=320) = 8.11$ ,  $p \geq .05$  It thus can yet be assumed a valid statement that men actively send more invites than women considering their already established network at the time-point of testing.



**Figure 22: Relative percentages of the frequencies of sent friend list invites.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant. While the majority estimated a 1:1 ratio, men were more likely to have actively sent an invite to the majority of their contacts on Facebook and vice versa.

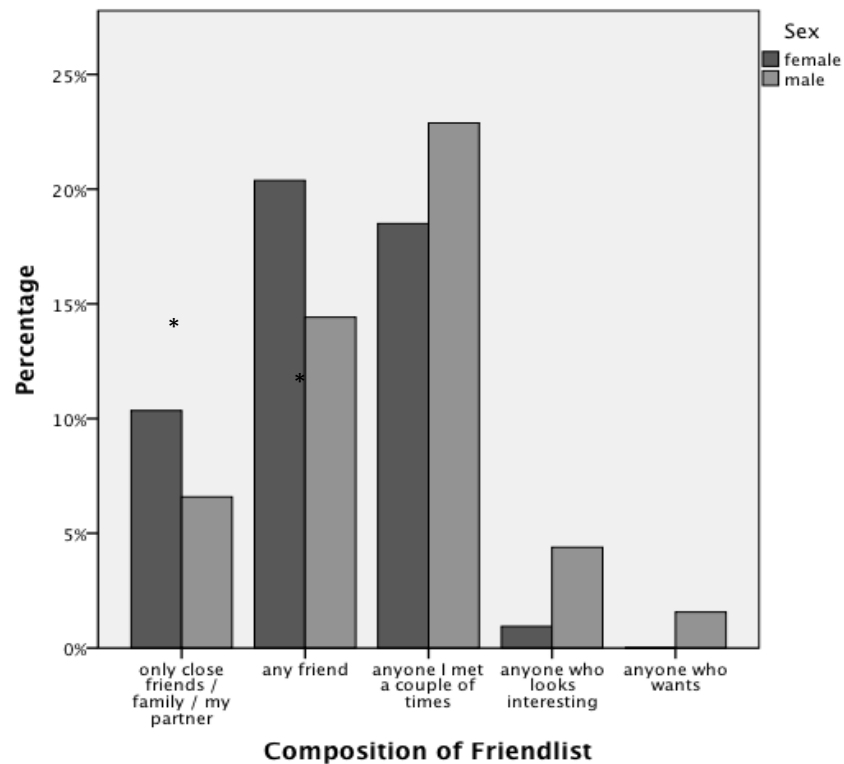
Finally a general readiness of acquiring new contacts, may the be of actively inviting or passively receiving nature, was assessed in the questionnaire to determine and validate the previously tested theory about a seeking or receiving behavior like expected from the established models of the behavior of the sexes in the real world.

Categories	Females	Males	Chi-Square	df
100%	1 (.0)	1 (.0)	8.11	6
80%	10 (-.4)	12 (.4)		
60%	16 (-2.5)	32 (2.5)		
50%	58 (1.8)	43 (-1.8)		
40%	41 (.4)	38 (-.4)		
20%	20 (-.3)	22 (.3)		
<20%	14 (.4)	12 (-.4)		

**Figure 23: Crosstabulation of the frequency of sent friend list invites.** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants. (N=320).  $p = .230$

Figure 24 shows a spectrum of significant associations between the provided categories, for how ones friend list was expanded in the past or potentially will be in the future, and the individual sexes. Men tend to be less restrictive in their acquisition of new contacts than women, which is also mirrored in the previously mentioned increased mean number of friends in total,  $\chi^2(4, N=320) = 19.73$ ,  $p \leq .001$ . This sheds new light on the male sex as not only being potential contestants for female attention in the virtual as well as the natural world but also using their peers to increase their own “social success” here with sheer numbers of Facebook friends improving their impact also on the other sex. The according detailed statistical analysis is provided in Figure 25. It seems that Facebook friends are an important indicative factor for popularity, which after all is measurement factor for influence and power, both traits highly wanted by the female sex.

\*



**Figure 24: Relative percentages of the frequencies of sent friend list invites.** Dark grey bars indicate the female distribution in the sample while light grey bars indicate male composition within the study. “Not published on Facebook” indicates that no occupation was entered for the public in ones profile page whereas asterisks mark categories which are significantly different between the sexes according to the corresponding adjusted residuals as well as an overall *Chi-square* test shown on in the according statistical analysis figure whereas a value  $p \leq .05$  was considered statistically significant.. A highly significant pattern across the categories can be identified in that men are less restrictive when it comes to generating their friend list in contrast to women.

Categories	Females	Males	Chi-Square	df
Only close friends/family/my partner	33 (1.8)	21 (-1.8)	19.73***	4
Any friend	65 (2.2)	46 (-2.2)		
Anyone I met a couple of times	59 (-1.7)	74 (1.7)		
Anyone who looks interesting	3 (-2.7)	14 (2.7)		
Anyone who wants	0 (-2.3)	5 (2.3)		

**Figure 25: Crosstabulation of the frequencies of friend list compositions.** Sexes are shown in the columns together with their absolute count as well as adjusted residual in parentheses below. A value higher than 2 or lower than -2 was considered statistically significant[79], taking into account an overall *Chi-square* test comparing the whole data sample shown on the right. Categories are shown in the rows. Total sample count included 160 males and 160 females participants. (N=320). \*\*\* $p \leq .001$



## 7. Discussion

### 7.1 General

This study shows that the tested prediction, that men are more likely to emphasize physical strength and ability in their online presence (“showing own body” with 8% of males vs. 2% of females) as well as social success (mean Nr. of friends 384.2 for men vs. 308.7 for women) at Facebook could be verified. Further also women could be shown, as suggested to emphasize, as suggested, to have a higher probability to focus on social interactions in their self-presentation and more restrictive in the creation of their friend lists as described in more detail in section 7.2. & 7.3. Surprisingly though no difference in communication habits could be identified during the study suggesting that these tested parameters do not serve as a corresponding marker for the different sexes.

It has been shown that virtual environments, especially social media environments, mirror more of our real-life characteristics than it would have been expected in an potential “uncontrolled” environment like Facebook. Interestingly, exactly those social networks that are created in the real life and life on in this virtual environment exhibit an influence may it be in social or other matter, which is strong enough to ensure that the majority of the information provided by the individual user to the platform resemble the reality most of the times. It has been unclear though and also the aim of this study to determine whether basic evolutionary behavioral principles like sexual investment theory, self-representational traits of the sexes as well as communicative trends could also be extrapolated in the same way to this virtual space.[43, 45] Web 2.0 and all its indications it had for the ultimate creation of social networks poses the ideal environment to study these questions like done in this study with Facebook as being the biggest and most influential social network these days.[41, 80] Considering the high usage rate of Facebook it can be extrapolated as well that a high amount of modern communication also happens via the channels provided there and that self-presentation at Facebook is of high importance for a reasonable amount of people in our human population.[81, 82]

The demographic population represented in this study largely represents potentially sexual active people ranging from 21-30 years of age, which is not surprising considering the age of the selected “hotspots/heavy users” for the distribution of the questionnaire comprising exactly that range. This resembles the majority of the core community as well as some parts of the younger potentially sexually more active users on Facebook.[80] Interestingly the occupational data suggests that at the time-point of data acquisition significantly more men were in a temporary or permanent employment situation, which could have various reasons but was not further analyzed in detail in this study. Since the data set is predominated collected from the western cultures no world-wide statements can be made. The usage rate of Facebook by the sampled population is very high and all users were considered highly active, which resembles what is already known in the literature and for sure is one of the driving phenomenon of Facebook. [83] Further catalyzing the usage rate of Facebook is certainly also its integration into the mobile environment of smartphones and constant world-wide web connections present in European and US cities at almost any given time.

## 7.2 Self-presentation

As discussed in the previous chapters self-presentation in humans is closely linked to sexual selection and ultimately with the inclusive fitness theory.[59] We suggested that sexual selected traits in the real life could potentially also be mimicked in the virtual environment. In particular we hypothesized that men would emphasize strength/ agility as well as social success to attract more potential mating candidates. In order to do so the profile picture could be used as a powerful visual stimulus whereas high numbers of friends could indicate a strong social significance rather than actual friendships. This study provides definite results that the profile pictures of men emphasize, as already suggested in prior studies, physical strength (showing own body with 8% of males vs. 2% of females) and achievements/activities in their self-representation (34% of males vs. 16% of females), as well as borderline insignificant general associations in terms of the absolute number of tagged pictures of themselves (Median of 96 for men vs. 51.5 for women). Additionally a higher mean number of friends were detected among males being 384.2 for men vs. 308.7 for women. The picture tags also go along with the previously mentioned sexual investment theory, whereas picture tags could be considered low-energy invested gametes in contrast to fewer,

52

potentially more selected tags, for women. A higher number of tagged pictures in the virtual social media environment are frequently associated with higher social impact and importance being primary selective reasons for potential mating partners. Only well established and socially interconnected and secured males can provide a save basis for progeny boosting their chances of survival. Additionally the significant emphasis of men on physical attributes and activities in their profile picture fit perfectly into already established models of what is a “desirable “ male and potentially successful/secure investment as a father, proposed by Buss et al. and Barber et al..[57, 63, 84, 85]

Women in contrast are more likely to be concentrated on social relationships and represent that clearly in their profile picture. Interestingly though, when it comes to display their own relationship status women are less informative to the public than men by mostly refusing to provide any data about it. Potentially this originates from a general drive to hide their availability status to help them interact in the virtual environment. Further a publicly announced single status might lead to an increased (potentially wanted or unwanted) contact rate by men. Thus hiding their relationship status provides women with a higher flexibility of acting in the environment of Facebook by controlling approaches of the opposite sex or simply avoiding social stigmas. Moreover, women are also more restrictive in admitting sexual orientation on Facebook. Additionally, they show increased control, thus a lower number, of tagged pictures despite a similar general activity on Facebook. Controlling the absolute amount and quality of these pictures thus seems to have a higher priority though the absolute time investment could not be measured at this point. These sexual restrictive traits and controlling of information flow to the outside world have already been trait marks for the female sex for a respectable amount of time according to Buss et al.[46, 56] Especially human females have specialized for example in hiding their current state of ovulation in order to keep their men closely associated with them.[86] Thus it was necessary for them to repeatedly copulate with the women to ensure reproduction. On the other hand this binding has been a role model for the creation of our still widely spread monogamous way of living. [67, 87-89] A similar control of information could be found in this study in terms of the relationship status, which is also more frequently hidden by women than by men. Though not the same binding-purpose as for the previously mentioned ovulation strategy can be extrapolated here a clear correlation with higher control of the information flow about oneself is seen here in context with the female sex.

### 7.3 Social Interaction

The sexual investment theory, as part of the Life history theory was originally defined by Trivers in 1972.[59] It differentiates the behavior of the sexes due the fact that each sex invests different amount of energy into their reproduction and has differentiated targets for their offspring. This principle can be seen throughout various species and can be projected to the human society as well. Thus it could be extrapolated that a certain impact of the differentiated behavior occurs also in terms of self-presentation in society and ultimately also in social media network contact lists. [45] We tested a prediction derived from this extrapolation that women as the restrictive/selective sex in the case of humans would also potentially show a similar restrictive pattern in the creation of one of the primary features of Facebook-the Friend list. Indeed we could show that women have not only a lower mean number of friends (mean Nr. of friends 384.2 for men vs. 308.7 for women) but are also less likely to add an unknown contact just out of interest (8.8% of men vs. 1.9% of woman added an unknown person that looked interesting).

In terms of social interaction we expected also certain differences between the sexes. In detail women were expected to be less outgoing then men as a parallel to parental investment theory whereas outgoing messaging on other walls would have indicated a actively seeking behavior. The social interaction part of this study delivered interesting results and helped to further interpret the acquired data from the first part. The data suggests that the tested parameters of social interaction frequency on the Timelines/Walls and private messaging patterns do not differ between the sexes at all. Thus the actual interaction seems to happen on an equal basis. Yet certain differences, like men being the sex which more actively invite contacts to their friend lists or women being more restrictive when it comes to generating new contacts resulting in a lower mean number of friends on Facebook, could be found identifying clear gender roles, which were already correlated before in the real world. As mentioned before, men naturally try to impress and attract potential partners which, according to the results of this study not only happens in real life but also in the Facebook environment.[46] Thus the friend list – the most central part of Facebook - has to be considered not as a simple contacts repertoire but also as a public statement of social involvement and

54

importance. It is obviously impossible to have more than 500 “real” friends, rather than random encounters. Dunbar et al. suggested that the maximum number of a direct socially interconnected, cohesive group only reach up to 100 to 230 individuals at any given time considering the size of the *Neocortex* as the limiting factor.[32] The literature states quite clearly that friendships on Facebook are different from real friendships so what is the real purpose of such a, sometimes obsessive, collection of contacts?[26, 41, 73, 75, 81, 82, 90, 91] This study showed that there is a clear association between men and having a higher mean total number of friends on Facebook (384.15 for men vs. 308.72 for women). Both of these mean numbers exceed by far the maximum stated by Dunbar et al., previously mentioned.[32] This suggests that rather than simply being only contributed to pure narcissism or networking this should also be contributed to an inherent male trait of showing social success similar to the previously mentioned picture tags though with clearer highly significant association. Additionally the data shows that each gender has significantly more contacts of its own gender but also that men actively invite more people into their friend list than vice versa. This is in accordance with the sexual selection theories whereas men are the actively “seeking” sex whereas women are selective in the borders of the available offers.[92] Further proof for the extrapolation of this theory can be seen in terms of the acquired friend-list composition data. Here women tend to be more restrictive than men who tend to add less close contacts as well.

Summarizing all of the discussed results above it can be clearly stated that the tested predictions derived from the parental investment theory as well as sexual selection theory could be verified in the cases of self-presentation and selective interactions. A suggested difference in the tested communication habit parameters could not be identified though. Later does not influence though the overall ability to predict human behavior in the online environment of Facebook via extrapolation of the aforementioned theories in the tested cases.

## 7.3 Outlook

Using those traits mentioned above, the theories of sexual selection, interaction and investment could be used to extrapolate predictions, which were proven right in the online community of Facebook by using integrated features as markers. This creates new potential ways to interpret social media networks as a vital resource for further, not only social, but also anthropological studies. Knowing and being able to interpret those traits can pose pivotal information for marketing strategies (behavioral marketing) and altering of existing or creating new features in Facebook as well as massive data mining on a global scale. Facebook itself will further emphasize on creating more accessibility to this data in the future since the company actively searches these days for new business models under the pressure of the recently acquired shareholders at the stock market, where Facebook was considered one of the biggest stock market entries of recent history. Additionally, this development will of course also affect single users of this platform since there are already new functions being tested on a small scale where individuals can prioritize their status updates in the news feeds of their friends by paying money being marked as “sponsored” message. Ultimately Facebook as any other social network on the world-wide web has an intrinsic pressure to sell as much information about it’s users as possible to 3<sup>rd</sup> party companies or state it in a more direct manner:

If you are not paying for it, you’re not the customer; you’re the product being sold.

How such platforms will alter our own social interaction patterns in the long run and how it may shift gender differences among the boundaries of the sex is hard to predict for now but this study proves that predictions, extrapolated from the sexual investment theory and sexual selection theory could be verified in the online community of Facebook and open the door for further studies because as stated by Mark Zuckerberg, CEO of Facebook, himself:

“I think that people just have this core desire to express who they are.  
- And I think that’s always existed.”

## 8. Appendix

### 8.1 Supplemental Statistics

Sex * Occupation Crosstabulation								
			Occupation					Total
			not published on Facebook	Student	permanently employed	Internship / temporary employment	unemployed	
Sex	female	Count	49 <sup>a, b</sup>	73 <sup>b</sup>	32 <sup>a, b</sup>	4 <sup>a</sup>	2 <sup>a, b</sup>	160
		Expected Count	43.5	63.5	42.0	9.5	1.5	160.0
		% within Sex	30.6%	45.6%	20.0%	2.5%	1.2%	100.0%
		% within Occupation	56.3%	57.5%	38.1%	21.1%	66.7%	50.0%
		% of Total	15.3%	22.8%	10.0%	1.2%	0.6%	50.0%
		Std. Residual	.8	1.2	-1.5	-1.8	.4	
		Adjusted Residual	1.4	2.2	-2.5	-2.6	.6	
	male	Count	38 <sup>a, b</sup>	54 <sup>b</sup>	52 <sup>a, b</sup>	15 <sup>a</sup>	1 <sup>a, b</sup>	160
		Expected Count	43.5	63.5	42.0	9.5	1.5	160.0
		% within Sex	23.8%	33.8%	32.5%	9.4%	0.6%	100.0%
		% within Occupation	43.7%	42.5%	61.9%	78.9%	33.3%	50.0%
		% of Total	11.9%	16.9%	16.2%	4.7%	0.3%	50.0%
		Std. Residual	-.8	-1.2	1.5	1.8	-.4	
		Adjusted Residual	-1.4	-2.2	2.5	2.6	-.6	
	Total	Count	87	127	84	19	3	320
		Expected Count	87.0	127.0	84.0	19.0	3.0	320.0
		% within Sex	27.2%	39.7%	26.2%	5.9%	0.9%	100.0%
		% within Occupation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	27.2%	39.7%	26.2%	5.9%	0.9%	100.0%

Each subscript letter denotes a subset of Occupation categories whose column proportions do not differ significantly from each other at the .05 level.

**Figure 26: Ad Figure 5 -Crosstabulation of occupations of the study as compared to the total sample.**

A

**Sex \* Characterization of own profile picture Crosstabulation**

			Characterization of own profile picture						Total
			overhead "MySpace" shot	alone	flirting with the camera	showing your own body	together with friends / partner / someone I know or like	other (no humans on the picture or not myself)	
Sex	female	Count	7a, b	99a, b	9a, b	3b	28a	14a, b	160
		Expected Count	7.5	102.0	7.5	8.0	20.0	15.0	160.0
		% within Sex	4.4%	61.9%	5.6%	1.9%	17.5%	8.8%	100.0%
		% within Characterization of own profile picture	46.7%	48.5%	60.0%	18.8%	70.0%	46.7%	50.0%
		% of Total	2.2%	30.9%	2.8%	0.9%	8.8%	4.4%	50.0%
		Std. Residual	-.2	-.3	.5	-1.8	1.8	-.3	
		Adjusted Residual	-.3	-.7	.8	-2.6	2.7	-.4	
	male	Count	8a, b	105a, b	6a, b	13b	12a	16a, b	160
		Expected Count	7.5	102.0	7.5	8.0	20.0	15.0	160.0
		% within Sex	5.0%	65.6%	3.8%	8.1%	7.5%	10.0%	100.0%
		% within Characterization of own profile picture	53.3%	51.5%	40.0%	81.2%	30.0%	53.3%	50.0%
		% of Total	2.5%	32.8%	1.9%	4.1%	3.8%	5.0%	50.0%
		Std. Residual	.2	.3	-.5	1.8	-1.8	.3	
		Adjusted Residual	.3	.7	-.8	2.6	-2.7	.4	
Total	Count		15	204	15	16	40	30	320
	Expected Count		15.0	204.0	15.0	16.0	40.0	30.0	320.0
	% within Sex		4.7%	63.7%	4.7%	5.0%	12.5%	9.4%	100.0%
	% within Characterization of own profile picture		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total		4.7%	63.7%	4.7%	5.0%	12.5%	9.4%	100.0%

Each subscript letter denotes a subset of Characterization of own profile picture categories whose column proportions do not differ significantly from each other at the .05 level.

B

**Sex \* Reasons for current profile picture Crosstabulation**

			Reasons for current profile picture					Total
			Looks attractive	Shows an activity of me	Shows my friendship / family / romantic relationship	Shows an achievement of me	Represents an opinion or attitude	
Sex	female	Count	68a	26b	18a	11a, b	37a, b	160
		Expected Count	62.5	40.0	11.5	11.5	34.5	160.0
		% within Sex	42.5%	16.2%	11.2%	6.9%	23.1%	100.0%
		% within Reasons for current profile picture	54.4%	32.5%	78.3%	47.8%	53.6%	50.0%
		% of Total	21.2%	8.1%	5.6%	3.4%	11.6%	50.0%
		Std. Residual	.7	-2.2	1.9	-.1	.4	
		Adjusted Residual	1.3	-3.6	2.8	-.2	.7	
	male	Count	57a	54b	5a	12a, b	32a, b	160
		Expected Count	62.5	40.0	11.5	11.5	34.5	160.0
		% within Sex	35.6%	33.8%	3.1%	7.5%	20.0%	100.0%
		% within Reasons for current profile picture	45.6%	67.5%	21.7%	52.2%	46.4%	50.0%
		% of Total	17.8%	16.9%	1.6%	3.8%	10.0%	50.0%
		Std. Residual	-.7	2.2	-1.9	.1	-.4	
		Adjusted Residual	-1.3	3.6	-2.8	.2	-.7	
Total	Count		125	80	23	23	69	320
	Expected Count		125.0	80.0	23.0	23.0	69.0	320.0
	% within Sex		39.1%	25.0%	7.2%	7.2%	21.6%	100.0%
	% within Reasons for current profile picture		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total		39.1%	25.0%	7.2%	7.2%	21.6%	100.0%

Each subscript letter denotes a subset of Reasons for current profile picture categories whose column proportions do not differ significantly from each other at the .05 level.

**Figure 27: Ad Figure 8 - (A) Crosstabulation of the characterization of the profile pictures. (B) Crosstabulation of the motives for the profile pictures**



Statistics			Hypothesis Test Summary				Statistics			
Number of tagged picture			Null Hypothesis	Test	Sig.	Decision	Number of tagged picture			
N	Valid	146	1	The medians of Number of tagged picture are the same across categories of Sex.	Independent-Samples Median Test	.117	Retain the null hypothesis.	N	Valid	153
	Missing	14						Missing	6	
Mean		303.49						Mean		226.12
Std. Error of Mean		60.645						Std. Error of Mean		26.638
Median		51.50						Median		96.00
Std. Deviation		732.773	2	The distribution of Number of tagged picture is the same across categories of Sex.	Independent-Samples Mann-Whitney U Test	.081	Retain the null hypothesis.	Std. Deviation		329.489
Percentiles	5	.00						Percentiles	5	.70
	25	14.00							25	30.00
	50	51.50							50	96.00
	75	296.25							75	300.00
	95	1287.10					95	957.30		

Asymptotic significances are displayed. The significance level is .05.

Figure 28: Ad Figure 10 -Statistical analysis of the absolute Number of picture tags.

Sex * Relationship status Crosstabulation						
			Relationship status			Total
			not published on Facebook	in a relationship	single	
Sex	female	Count	95 <sup>a</sup>	47 <sup>a</sup>	18 <sup>b</sup>	160
		Expected Count	79.5	49.0	31.5	160.0
		% within Sex	59.4%	29.4%	11.2%	100.0%
		% within Relationship status	59.7%	48.0%	28.6%	50.0%
		% of Total	29.7%	14.7%	5.6%	50.0%
		Std. Residual	1.7	-.3	-2.4	
		Adjusted Residual	3.5	-.5	-3.8	
	male	Count	64 <sup>a</sup>	51 <sup>a</sup>	45 <sup>b</sup>	160
		Expected Count	79.5	49.0	31.5	160.0
		% within Sex	40.0%	31.9%	28.1%	100.0%
		% within Relationship status	40.3%	52.0%	71.4%	50.0%
		% of Total	20.0%	15.9%	14.1%	50.0%
		Std. Residual	-1.7	.3	2.4	
		Adjusted Residual	-3.5	.5	3.8	
Total	Count	159	98	63	320	
	Expected Count	159.0	98.0	63.0	320.0	
	% within Sex	49.7%	30.6%	19.7%	100.0%	
	% within Relationship status	100.0%	100.0%	100.0%	100.0%	
	% of Total	49.7%	30.6%	19.7%	100.0%	

Each subscript letter denotes a subset of Relationship status categories whose column proportions do not differ significantly from each other at the .05 level.

Figure 29: Ad Figure 12 - Crosstabulation of the relationship status field options.

Sex * "Interested in" Field Crosstabulation						
		"Interested in" Field				Total
		not published on Facebook	women	men	both	
Sex	female	Count	128 <sup>a</sup>	3 <sup>b</sup>	26 <sup>c</sup>	160
		Expected Count	106.0	35.5	14.5	160.0
		% within Sex	80.0%	1.9%	16.2%	100.0%
		% within "Interested in" Field	60.4%	4.2%	89.7%	50.0%
		% of Total	40.0%	0.9%	8.1%	50.0%
		Std. Residual	2.1	-5.5	3.0	
		Adjusted Residual	5.2	-8.7	4.5	
	male	Count	84 <sup>a</sup>	68 <sup>b</sup>	3 <sup>c</sup>	160
		Expected Count	106.0	35.5	14.5	160.0
		% within Sex	52.5%	42.5%	1.9%	100.0%
		% within "Interested in" Field	39.6%	95.8%	62.5%	50.0%
		% of Total	26.2%	21.2%	0.9%	50.0%
		Std. Residual	-2.1	5.5	-3.0	
		Adjusted Residual	-5.2	8.7	-4.5	
Total		Count	212	71	29	320
		Expected Count	212.0	71.0	29.0	320.0
		% within Sex	66.2%	22.2%	9.1%	100.0%
		% within "Interested in" Field	100.0%	100.0%	100.0%	100.0%
		% of Total	66.2%	22.2%	9.1%	100.0%

Each subscript letter denotes a subset of "Interested in" Field categories whose column proportions do not differ significantly from each other at the .05 level.

Figure 30: Ad Figure 14 - Crosstabulation of the "interested in" field options.

Statistics			Hypothesis Test Summary				Statistics		
Number of Facebook Friends			Null Hypothesis	Test	Sig.	Decision	Number of Facebook Friends		
N	Valid	156	1 The medians of Number of Facebook Friends are the same across categories of Sex.	Independent-Samples Median Test	.159	Retain the null hypothesis.	N	Valid	159
	Missing	4						Missing	0
Mean		308.72	2 The distribution of Number of Facebook Friends is the same across categories of Sex.	Independent-Samples Mann-Whitney U Test	.039	Reject the null hypothesis.	Mean		384.15
Std. Error of Mean		20.589					Std. Error of Mean		34.173
Median		241.00					Median		282.00
Std. Deviation		257.156					Std. Deviation		430.900
Minimum	23						Minimum	10	
Maximum	2000						Maximum	4500	
Percentiles	5	83.10					Percentiles	5	58.00
	25	150.00						25	187.00
	50	241.00						50	282.00
	75	403.75						75	474.00
	95	700.75						95	900.00

Asymptotic significances are displayed. The significance level is .05.

Figure 31: Ad Figure 18 - Statistical analysis of the absolute Number of Facebook friends.

Sex \* Frequency of FEMALE friends Crosstabulation

			Frequency of FEMALE friends					Total
			80%	60%	50%	40%	20%	
Sex	female	Count	9 <sub>a</sub>	61 <sub>a</sub>	67 <sub>a, b</sub>	22 <sub>b</sub>	1 <sub>a, b</sub>	160
		Expected Count	6.0	50.5	66.0	35.0	2.5	160.0
		% within Sex	5.6%	38.1%	41.9%	13.8%	0.6%	100.0%
		% within Frequency of FEMALE friends	75.0%	60.4%	50.8%	31.4%	20.0%	50.0%
		% of Total	2.8%	19.1%	20.9%	6.9%	0.3%	50.0%
		Std. Residual	1.2	1.5	.1	-2.2	-.9	
		Adjusted Residual	1.8	2.5	.2	-3.5	-1.4	
	male	Count	3 <sub>a</sub>	40 <sub>a</sub>	65 <sub>a, b</sub>	48 <sub>b</sub>	4 <sub>a, b</sub>	160
		Expected Count	6.0	50.5	66.0	35.0	2.5	160.0
		% within Sex	1.9%	25.0%	40.6%	30.0%	2.5%	100.0%
		% within Frequency of FEMALE friends	25.0%	39.6%	49.2%	68.6%	80.0%	50.0%
		% of Total	0.9%	12.5%	20.3%	15.0%	1.2%	50.0%
		Std. Residual	-1.2	-1.5	-.1	2.2	.9	
		Adjusted Residual	-1.8	-2.5	-.2	3.5	1.4	
Total	Count		12	101	132	70	5	320
	Expected Count		12.0	101.0	132.0	70.0	5.0	320.0
	% within Sex		3.8%	31.6%	41.2%	21.9%	1.6%	100.0%
	% within Frequency of FEMALE friends		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total		3.8%	31.6%	41.2%	21.9%	1.6%	100.0%

Each subscript letter denotes a subset of Frequency of FEMALE friends categories whose column proportions do not differ significantly from each other at the .05 level.

Figure 32: Ad Figure 21 - Crosstabulation of the frequency of female friends.

Sex \* Frequency of SENT INVITES Crosstabulation

			Frequency of SENT INVITES						Total	
			100%	80%	60%	50%	40%	20%		<20%
Sex	female	Count	1 <sub>a</sub>	10 <sub>a</sub>	16 <sub>a</sub>	58 <sub>a</sub>	41 <sub>a</sub>	20 <sub>a</sub>	14 <sub>a</sub>	160
		Expected Count	1.0	11.0	24.0	50.5	39.5	21.0	13.0	160.0
		% within Sex	0.6%	6.2%	10.0%	36.2%	25.6%	12.5%	8.8%	100.0%
		% within Frequency of SENT INVITES	50.0%	45.5%	33.3%	57.4%	51.9%	47.6%	53.8%	50.0%
		% of Total	0.3%	3.1%	5.0%	18.1%	12.8%	6.2%	4.4%	50.0%
		Std. Residual	.0	-.3	-1.6	1.1	.2	-.2	.3	
		Adjusted Residual	.0	-.4	-2.5	1.8	.4	-.3	.4	
	male	Count	1 <sub>a</sub>	12 <sub>a</sub>	32 <sub>a</sub>	43 <sub>a</sub>	38 <sub>a</sub>	22 <sub>a</sub>	12 <sub>a</sub>	160
		Expected Count	1.0	11.0	24.0	50.5	39.5	21.0	13.0	160.0
		% within Sex	0.6%	7.5%	20.0%	26.9%	23.8%	13.8%	7.5%	100.0%
		% within Frequency of SENT INVITES	50.0%	54.5%	66.7%	42.6%	48.1%	52.4%	46.2%	50.0%
		% of Total	0.3%	3.8%	10.0%	13.4%	11.9%	6.9%	3.8%	50.0%
		Std. Residual	.0	.3	1.6	-1.1	-.2	.2	-.3	
		Adjusted Residual	.0	.4	2.5	-1.8	-.4	.3	-.4	
Total	Count	2	22	48	101	79	42	26	320	
	Expected Count	2.0	22.0	48.0	101.0	79.0	42.0	26.0	320.0	
	% within Sex	0.6%	6.9%	15.0%	31.6%	24.7%	13.1%	8.1%	100.0%	
	% within Frequency of SENT INVITES	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	0.6%	6.9%	15.0%	31.6%	24.7%	13.1%	8.1%	100.0%	

Each subscript letter denotes a subset of Frequency of SENT INVITES categories whose column proportions do not differ significantly from each other at the .05 level.

Figure 33: Ad Figure 23 - Crosstabulation of the frequency of sent friend list invites.

Sex \* Composition of Friendlist Crosstabulation

			Composition of Friendlist					Total
			only close friends / family / my partner	any friend	anyone I met a couple of times	anyone who looks interesting	anyone who wants	
Sex	female	Count	33 <sup>a</sup>	65 <sup>a</sup>	59 <sup>a, b</sup>	3 <sup>b</sup>	0 <sup>a, b</sup>	160
		Expected Count	27.0	55.5	66.5	8.5	2.5	160.0
		% within Sex	20.6%	40.6%	36.9%	1.9%	0.0%	100.0%
		% within Composition of Friendlist	61.1%	58.6%	44.4%	17.6%	0.0%	50.0%
		% of Total	10.3%	20.3%	18.4%	0.9%	0.0%	50.0%
		Std. Residual	1.2	1.3	-.9	-1.9	-1.6	
		Adjusted Residual	1.8	2.2	-1.7	-2.7	-2.3	
	male	Count	21 <sup>a</sup>	46 <sup>a</sup>	74 <sup>a, b</sup>	14 <sup>b</sup>	5 <sup>a, b</sup>	160
		Expected Count	27.0	55.5	66.5	8.5	2.5	160.0
		% within Sex	13.1%	28.7%	46.2%	8.8%	3.1%	100.0%
		% within Composition of Friendlist	38.9%	41.4%	55.6%	82.4%	100.0%	50.0%
		% of Total	6.6%	14.4%	23.1%	4.4%	1.6%	50.0%
		Std. Residual	-1.2	-1.3	.9	1.9	1.6	
		Adjusted Residual	-1.8	-2.2	1.7	2.7	2.3	
Total	Count	54	111	133	17	5	320	
	Expected Count	54.0	111.0	133.0	17.0	5.0	320.0	
	% within Sex	16.9%	34.7%	41.6%	5.3%	1.6%	100.0%	
	% within Composition of Friendlist	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.9%	34.7%	41.6%	5.3%	1.6%	100.0%	

Each subscript letter denotes a subset of Composition of Friendlist categories whose column proportions do not differ significantly from each other at the .05 level.

Figure 34: Ad Figure 25 - Crosstabulation of the friend list composition.

## 8.2 List of figures

<b>Figure</b>	<b>Page</b>
Figure 1: Social media websites sorted by topic of offers via their company logos.	9
Figure 2: Representative of a Facebook user profile	11
Figure 3: Relative percentages of age-compositions of the study as compared to the total sample.	26
Figure 4: Relative percentages of occupations.	27
Figure 5: Crosstabulation of occupations of the study as compared to the total sample.	28
Figure 6: Relative percentages of general usages patterns.	29
Figure 7: Characterization of the profile pictures by the users via predefined categories.	31
Figure 8: A) Crosstabulation of the characterization of the profile pictures. B) Crosstabulation of the motives for the profile pictures.	32
Figure 9: Motivations for the profile pictures by the users via predefined categories.	33
Figure 10: Statistical analysis of the absolute Number of picture tags.	34
Figure 11: Relative percentages of the relationship status field options in the sample.	35
Figure 12: Crosstabulation of the relationship status field options.	35
Figure 13: Relative percentages of the “interested in” field options in the sample.	36
Figure 14: Crosstabulation of the “interested in” field options.	37
Figure 15: Relative percentages of the posting frequency on ones own Wall/Timeline.	39
Figure 16: Relative percentages of the posting frequency on other Walls/Timelines.	39
Figure 17: Relative percentages of the frequency of private messages.	40
Figure 18: Statistical analysis of the absolute Number of Facebook friends.	42
Figure 19: Frequency of clustered number of Facebook friends.	42
Figure 20: Relative percentages of the estimated female frequency in ones own friend list.	43
Figure 21: Crosstabulation of the frequency of female friends.	44
Figure 22: Relative percentages of the frequencies of sent friend list invites.	45
Figure 23: Crosstabulation of the frequency of sent friend list invites.	46
Figure 24: Relative percentages of the frequencies of sent friend list invites.	47

Figure 25: Crosstabulation of the friend list composition.	48
Figure 26: Ad Figure 5 -Crosstabulation of occupations of the study as compared to the total sample.	54
Figure 27: Ad Figure 8 - (A) Crosstabulation of the characterization of the profile pictures. (B) Crosstabulation of the motives for the profile pictures	55
Figure 28: Ad Figure 10 -Statistical analysis of the absolute Number of picture tags.	
Figure 28: Ad Figure 10 -Statistical analysis of the absolute Number of picture tags.	56
Figure 29: Ad Figure 12 - Crosstabulation of the relationship status field options.	56
Figure 30: Ad Figure 14 - Crosstabulation of the “interested in” field options.	57
Figure 31: Ad Figure 18 - Statistical analysis of the absolute Number of Facebook friends.	57
Figure 32: Ad Figure 21 - Crosstabulation of the frequency of female friends.	58
Figure 33: Ad Figure 23 - Crosstabulation of the frequency of sent friend list invites.	58
Figure 34: Ad Figure 25 - Crosstabulation of the friend list composition.	59

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**Table 3: List of figures**

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## 8.4 Curriculum vitae

# Mag. Alexander Frühwirth

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### PROFILE

Name	Mag. Alexander FRÜHWIRTH
Date of Birth	02-03-1986
Marital Status	not married
Nationality	Austria



### EDUCATION

<b>2012</b> February → ongoing	<b>ETH Zürich, Switzerland</b> Assessing memory B cell subset plasticity in various vaccination settings at the Institute for Research in Biomedicine (IRB), Bellinzona. (Supervisor: Prof. Antonio Lanzavecchia)	<b>PhD in Immunology</b>
<b>2009</b> January → July 2009	<b>Sweden, Lund University</b> Master-Courses in Immunology with the Erasmus-Program of the European Union.	<b>Exchange Semester</b>
<b>2005</b> October → December 2011	<b>University of Vienna</b> Specializing in Genetics on Immunology/Virology.	<b>Study</b> <b>Genetics/Microbiology</b>
<b>2005</b> October → ongoing	<b>University of Vienna</b> Specializing in Human Genetics/Social Anthropology.	<b>Study Anthropology</b>
<b>1996</b> September → June 2004	<b>Konrad Lorenz Gymnasium</b> Natural science high school graduation with distinction in the subjects Biology, Chemistry, Mathematics, German and English	<b>High School Graduation</b> <b>Gänserndorf</b>

## EXPERIENCE

**2010**    *October*

→ Feb 2012

**Tutor**

**University of Vienna**

Tutoring students in the Laboratory Practical: Biochemistry II (Prof. Barbara Hamilton)

**2010**    *July*

→ April 2011

**Master Thesis**

**Intercell AG**

Profiling the immune reaction of the companies own adjuvant IC31 applied topically together with different antigens using various kinds of immunological state of the art techniques like intracellular , surface and proliferation flow cytometric stainings, ELISA, ELISPOT,... (Supervisor: Prof. Alexander von Gabain)

**2010**    *April*

→ May 2010

**Research Assistant**

**Singapore Immunology  
Network (SigN) A\*Star**

Research Assistant in the Singapore Immunology Network Department (SigN) of the Agency for Science, Technology and Research (A\*Star), studying the Subversion of Toll-like receptor signaling by Pathogens with the help of new virulence factors like TcpC via rt-PCR. (Principal Investigator: Dr. Catharina Svanborg)

**2009**    *December*

→ June 2010

**Research Assistant**

**Immunological Dpt.  
Baxter Bioscience**

Developing and characterizing a mouse model considering the brake of immune tolerance against blood coagulation factor VII, as well as performing different other kinds of experiments like RNA-isolation, PCR and ELISA. (Principal Investigator: Doz. Dr. Birgit Reipert)

**2009**    *August*

→ October 2009

**Research Assistant**

**Immunological Dpt.  
Baxter Bioscience**

10-weeks internship in the Animal models group establishing new and approved immunological methods on surveying Beta-Sheet Aggregates in pharmaceutical products, like FACS, Multiplex, ELISPOT, Thioflavin-T assay, tPA-activation/binding assay and ELISA. (Principal Investigator: Doz. Dr. Birgit Reipert)

**2008**      *July*  
→ *October 2008*

**Research Assistant**

**Preclinical Research  
and Development,  
Baxter Bioscience**

10-weeks internship in the Biochemical Product Characterization department. Structural und functional analysis of different recombinant blood coagulation factors with the help of common and new developed immunological assays (Western Blot, SDS-Page, ELISA, Chromogenassays, Cell-based Assays...) (Principal Investigator: Dr. Katalin Varadi)

**2007** *November*  
→ *April 2008*

**Laboratory support**

**Ecwork Laboratories  
Consulting GmbH**

Supportive works in the laboratory.

**2007**

**Maintenance**

**Planpool**

Maintenance of disinfection systems in the spa- and wellness area.

**2004**      *June*

**Event management**

**Association for new  
Media Marchfeld**

Organization and coordination of public youth events in the district of Gänserndorf, Lower Austria. Last event with 200people was localized in the event hall „Optimum Matzen“.

**2004**      *October*  
→ *October 2005*

**Civil Service**

**Lebenshilfe  
Niederösterreich**

Work with disabled people in a protected facility and driving service in Lower Austria.

## AWARDS

### & Stipends

**2009** *November*

**Singapore International Pregraduate Award of A\*Star Singapore (Agency for Science, Technology and Research Singapore)**

**2009** *January*

**Erasmus Outgoing Stipend, European Union**

**2009** *January*

**Top-Stipend for Outgoing Students, Lower Austria**

**2006** *November*

**Top-Stipend for Students, Lower Austria**

## ORGANISATIONS

**ÖGGGT**

Austrian association for genetics and gene technology

**STV Biologie**

Student representatives for Biology

**DB**

Association for new Media Marchfeld

**TZW**

Diving Center Vienna

## SOCIAL

### & Volunteering

**2009** *April*

**Erasmus Student Network**

*→ lasting*

Mentoring for exchange students in Vienna in the “buddy-network” program.

**2008** *November*

**University of Vienna**

Applied “Reef Check” program in a coral reef in Dahab, Egypt.

**2006** *October*

**Student representatives for Biology**

*→ lasting*

Tutoring and mentoring for students. Search committee for the professorship for “In Silico Genomics”. Organization of information events.

**2000** *June*

**Association for new Media Marchfeld**

*→ lasting*

Organization of private IT-Workshops.

## LANGUAGES

<b>English</b>	Excellent in speech and writing, TOEFL certificate (112/120), Numerous language stays in e.g. New Orleans, Eastbourne, St. Barbara, Singapore and an exchange term in Lund, Sweden.
<b>French</b>	High school level
<b>Swedish</b>	Basics

## CONFERENCES

attended

<b>2009</b>	<b>2nd Symposium on HAMLET and Tumor-Killing Proteins Lund, Sweden</b>
<b>2010</b>	<b>World Day of Immunology 2010, A*Star, Singapore</b>
<b>2010</b>	<b>4<sup>th</sup> Elsevier Vaccine and ISV Annual Global Congress, Vienna, Austria</b>
<b>2011</b>	<b>5<sup>th</sup> Semmering Vaccine Symposium, Baden, Austria</b>
<b>2011</b>	<b>3<sup>rd</sup> International PhD Workshop, IAI, Medical University Vienna, Austria</b>

## INTERESTS

& Motivation

My main scientific interests are Immunology, Virology and Vaccine development. I am also engaging myself as a student representative in biology and in the "buddy-network" of ESN for international exchange students. International orientation and mobility is of great professional and even more personal importance to me. I enjoy very much being challenged by other people, be it at work, in a diverse team, provocative projects or in academic studies – I take great inspirations and satisfaction from such challenges and consider myself a downright communicative person.



## 8.5 Eidesstattliche Erklärung

Ich erkläre an Eides statt, dass ich diese Diplomarbeit selbständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe. Die Stellen meiner Arbeit, die dem Wortlaut oder dem Sinn nach anderen Werken entnommen sind, habe ich in jedem Fall unter Angabe der Quelle als Entlehnung kenntlich gemacht. Dasselbe gilt sinngemäß für Tabellen, Karten und Abbildungen.

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Weiters bin ich damit einverstanden, dass ein Exemplar meiner Diplomarbeit in der Bibliothek ausgeliehen werden kann.

Wien, am

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Unterschrift