Anchoring biases in estimations of age, weight and height

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“..a certain type of perfection can only be realized through a limitless accumulation of the imperfect.”
Haruki Murakami
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Abstract

The main purpose of this thesis was to study the circumstances under which anchoring biases occur for estimation of age, weight and height. Paper I investigated accuracy and biases in age estimates made by salespersons with experience in age estimation, compared to a control group without any similar experience. The accuracy in age estimates of young target persons (15-24 years old) made by salespersons was higher than that of control persons. Moreover, the salespersons demonstrated less overestimation of the age of younger target persons, and whereas the control group own-anchored in their age estimates, the salespersons did not. Paper II and IV investigated gender differences in the tendency to own-anchor in within- and cross-gender estimates of age, weight and height. Both papers found that women own-anchor spontaneously both within and across gender, whereas men for the most part own-anchor only in their estimates of other men. Paper IV also investigated the possibility to increase own-anchoring by priming the participants’ use of their own characteristics in their estimation of age, weight and height. Elaborated similarity priming (asking the participants to state their estimates in relation to their own characteristics) did influence the estimates, by increasing the participants’ tendency to own-anchor. Paper III aimed to investigate whether standard anchoring effects (i.e., assimilation towards explicit, experimenter-provided comparison values) occur for estimations of age and quantities – estimations based on visual stimuli and made with a higher degree of certainty as compared to the judgments traditionally used in the standard anchoring paradigm. Anchor effects were found for both age estimations and quantity estimations, and were not affected by neither cognitive load nor source credibility.

Keywords: anchoring, anchor effects, own-anchor effect, assimilation, contrast, age estimation, weight estimation, height estimation, social judgments
Huvudsyftet med denna avhandling var att undersöka under vilka omständigheter som förankringsbias uppstår vid skattningar av ålder, vikt och längd. Artikel I undersökte korrekthet och bias i åldersbedömningar gjorda av butikspersonal med erfarenhet av åldersbedömning, jämfört med en kontrollgrupp utan motsvarande erfarenhet. Butikspersonalen uppförde högre korrekthet vid åldersskattningar av unga personer (15-24 år) än personerna i kontrollgruppen gjorde. Butikspersonalen uppförde också lägre grad av överskattning av yngre personers ålder, och medan kontrollgruppen egenförankrade sina skattningar i sin egen ålder, så gjorde inte butikspersonalen det. Artikel II och IV undersökte könsskillnader i benägenheten att egenförankra vid skattningar av ålder, vikt och längd inom respektive över könsgränserna. Båda artiklarna fann att kvinnor egenförankrar naturligt både inom och mellan könsgränserna, medan män till övervägande del endast egenförankrar i sina skattningar av andra män. Artikel IV undersökte dessutom möjligheten att öka egenförankringen genom att primea deltagarnas användning av sina egna egenskaper i bedömningar av ålder, vikt och längd. Elaborerad likhetspriming (där deltagarna ombads att göra sina bedömningar i relation till sina egna egenskaper) påverkade skattningarna genom att öka deltagarnas tendens till egenförankring. Artikel III syftade till att undersöka huruvida även klassiska förankringseffekter (d.v.s. assimilation gentemot explicita jämförelsevärdet) uppstår för bedömningar av ålder och kvantiteter – bedömningar baserade på visuellt stöd och gjorda med en högre grad av säkerhet jämfört med de bedömningar som vanligen används inom standardparadigmet. Förankringseffekter uppförades för bedömningar av både ålder och kvantiteter, och påverkades inte av manipulationer gällande kognitiv belastning och trovärdighet hos ursprunget till jämförelsevärdet.

Nyckelord: förankring, förankringseffekter, egenförankring, assimilation, kontrast, åldersbedömning, viktbedömning, längdbedömning, sociala bedömningar
List of papers

Paper I

Paper II

Paper III

Paper IV

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Introduction

For most people, estimations of other people’s characteristics are a part of everyday life. After meeting a new acquaintance, you might ponder about their age; when you see someone skinny, you may wonder how little they actually weigh; and when you see an especially tall person, you might ask yourself how much taller than yourself they are. Estimations of similar characteristics have many professional applications, and are particularly important when it comes to limiting access to alcohol or tobacco for underaged individuals. Age, height and build are characteristics commonly used to describe other individuals in people’s daily lives, and are additionally among the attributes that witnesses spontaneously mention in offender portrayals (Fahsing, Ask, & Granhag, 2004). Furthermore, the police often ask witnesses to report these characteristics of the offender (van Koppen & Lochun, 1997; Pozzulo & Warren, 2003). Human judgments, especially judgments of the social kind, are comparative by nature. Several of the most prominent biases in psychology are self-related, and when making judgments of others, people tend to compare with themselves. In estimations of age, weight and height, people tend to use their own corresponding characteristics as starting points (i.e., anchors), in which they base their estimations, which typically results in assimilation of the estimates toward the estimators’ own characteristics. Hence, a tall person might compare others with their own height and thus tend to overestimate others’ height, and a young person may compare others with their own age and thus regularly underestimate the age of others’. This phenomenon has been termed the own-anchor effect and is relevant for both theoretical and applied purposes. The own-anchor effect is one of several biases affecting estimations of age, weight and height based on visual stimuli, which the present thesis mainly concerns. Importantly, the present thesis concerns estimates of these characteristics made mainly by novices, based on visual stimuli. Hence, it does not address age estimation made for forensic or medical purposes.

Accuracy and biases in estimation of age, weight and height

The accuracy in age estimates of unknown individuals based on visual stimuli is fairly high (Burt & Perrett, 1995; Ebbesen & Rienick, 1998; Fahsing et al., 2004; George & Hole, 1995, 1998, 2000; van Koppen & Lochun, 1997), and the estimates are rather unaffected by manipulations trying to make the estimates
harder (e.g., by inverting facial images or blurring the skin information in facial images, George & Hole, 1995, 2000).

Most studies on age estimation accuracy have measured accuracy as the mean deviation between estimate and correct value (see Rhodes, 2009, for a review). With these measures, age estimates of faces tend to fall on average between 2-4 years from the actual age (Burt & Perrett, 1995; George & Hole, 2000; Sörqvist & Eriksson, 2007). Fahsing et al. (2004) defined estimates of age and height as correct if they fell within an interval of ± 2.5 cm or years from the true value (43.6 % of the height estimates and 38.1 % of the age estimates in their archival study were correct according to this definition), and partly correct if they fell within an interval of ± 5 cm or years from the true value (34.1 % of the height estimates and 22.3 % of the age estimates in their study). van Koppen and Lochun (1997) in a similar manner found age estimates to be correct in 61 % of the cases and partially correct in 37 %, and height estimates to be correct in 52% of the time and partially correct in 45 %. The weight of unfamiliar others tend to be underestimated. Tollestrup, Turtle and Yuille (1994) found in their archival analysis witnesses to underestimate the weight of perpetrators by on average 4.78 pounds, and victims to underestimate the same weight by an average of 7.56 pounds. Similarly, Anglemeyer, Hernandez, Brice and Zou (2004) found health care workers to generally underestimate the weight of patients by between 1.39-4.85 kg’s, and Vartanian, Herman and Polivy (2004) found participants to underestimate others’ weight by between 0.31-3.95 kg’s.

Although people tend to be rather accurate in their estimates of others’ age, weight and height, there are several systematic errors and biases affecting these estimates (e.g., Biernat, Manis, & Nelson, 1991; Flin & Shepherd, 1986; Lee & Geiselman, 1994). In general, the age of young individuals tends to be overestimated, whereas the age of older individuals tends to be underestimated (George & Hole, 1995; Henss, 1991; Pittenger & Shaw, 1975; Sörqvist & Eriksson, 2007; Willner & Rowe, 2001). These biases may reflect a regression towards the mean (e.g., Fahsing et al., 2004; Flin & Shepherd, 1986), but they may also reflect a tendency for assimilation of age estimates towards the estimator’s own age (i.e., an own-anchor effect). Furthermore, age estimates of younger individuals tend to be more accurate than age estimates of older individuals (Rhodes, 2009; Voelkle, Ebner, Lindeberger, & Riediger, 2012; Moyse, 2014), and younger participants have been found to estimate age with greater accuracy than older participants (Moyse, 2014). There are also some support for gender differences in age estimation, indicating that women’s age estimates to be more accurate than men’s (Nkengne et al., 2008),
although other studies have failed to find such a difference (Dehon & Brédart, 2001; Henss, 1991).

Moreover, estimates of people’s weight and height are affected by stereotypes related to the gender and ethnicity of the target persons (Biernat et al., 1991; Lee & Geiselman, 1994; Geiselman, Lam, Lee & Chen, 1995). For example, men are generally heavier and taller than women, and knowledge of this affects weight and height estimations such that a man and a woman of equal characteristics will be estimated differently (e.g., Biernat et al., 1991). Moreover, Asians are commonly perceived to be shorter than Caucasians, which is reflected in generally lower height estimates of Asians than of Caucasians (Lee & Geiselman, 1994; Geiselman et al., 1995).

Own-group biases have also been found to influence social judgments. People are generally more skilled at estimating the characteristics of people in their own group. The own-race bias or cross-race effect (Sporer, 2001; Meissner & Brigham, 2001) refers to people generally being better at recognizing individuals of their own race than of other races and is probably the most well-known in-group bias in social judgments. Interestingly, people are not only generally more accurate in recognizing and identifying others with the same ethnicity as themselves; they are also more accurate in identifying other individuals in their own age (e.g., Anastasi & Rhodes, 2005; Rhodes & Anastasi, 2012), and in identifying individuals categorized as members of their in-groups in general (e.g., Bernstein, Young, & Hugenberg, 2007). Similarly, there are findings indicating that age estimates are more accurate for both own-race estimations (Dehon & Brédart, 2001) and own-age group estimations (Anastasi & Rhodes, 2006; George & Hole, 1995; Moyse, 2014; Moyse & Brédart, 2012; Voelke et al., 2012).

Age estimates have been shown to improve with training, at least when the training involves feedback. In Sörqvist and Eriksson (2007), young target persons (15-24 years) were estimated with greater accuracy than middle-aged and older persons were, and training improved the accuracy in estimates of older target persons. As the participants were rather young, this finding can partly be explained by participants being better at estimating the age of people of about the same age as themselves.

### Anchoring effects

One of the most well-known biases affecting human judgments and estimations is the anchoring effect (i.e., the assimilation of numerical estimates towards primed numerical values). The anchoring heuristic was first presented in the seminal work of Tversky and Kahneman (1974), in
which the authors noted that numeric judgments under uncertainty are assimilated towards salient comparison values (i.e., anchors). In their original experiment, participants’ estimates of the percentage of African countries in the United Nations were clearly affected by seemingly arbitrary comparison values (supposedly determined by spinning a wheel of fortune), in that a low previous comparison value led to lower subsequent absolute estimates than did a high anchor value. Research on anchoring has since then been carried out in a multitude of different areas, most often concerning general knowledge (see Furnham & Boo, 2011, for a review).

Following the original procedure, in a standard anchoring task participants are first given a comparative question (e.g., “Is the tallest oak tree in Sweden more or less than 80 meters tall?”) with either a high or low comparison value, followed by a question about the absolute value (e.g., “How many meters tall is the tallest oak tree in Sweden?”). As demonstrated repeatedly in many different areas, the answers to the absolute question in a similar context tend to be affected by the preceding anchor in the comparative question, such that participants given a low anchor typically give lower estimations in the subsequent absolute question than do participants given a high anchor. Anchoring effects are very robust (e.g., Klein et al., 2014) and have been demonstrated in various different domains, including answers to general knowledge questions (e.g., Epley & Gilovich, 2001; Jacowitz & Kahneman, 1995; Mussweiler & Strack, 1999b), juridical judgments (e.g., Englich & Mussweiler, 2001; Englich, Mussweiler, & Strack, 2006), purchase behaviors (e.g., Ariely, Loewenstein, & Prelec, 2003; Wansink, Kent, & Hoch, 1998), self efficacy judgments (Cervone & Peake, 1986), confidence judgments (Carroll, Petrusic, & Leth-Steensen, 2009), probability estimates (e.g., Chapman & Johnson, 1999), willingness to accept high numbers of migrants (Lalot, Quiamzade, & Falomir-Pichastor, 2019), willingness to pay (e.g., Frech, Loschelder, & Friese, 2019) and beliefs in global warming (Joireman, Truelove, & Duell, 2010), to the extent that they are regarded as ubiquitous.

As pointed out by Chapman and Johnson (2002), the term anchoring is not being used consistently; sometimes it refers to the experimental procedure of presenting participants with uninformative but salient numbers in anchoring experiments; sometimes to the result that estimates are bias towards initial starting values, and sometimes to the psychological process behind the result. In the present thesis, the term anchoring is used to refer to the psychological process, whereas the term anchor effect is used to refer to the result. In the classic work by Tversky and Kahneman (1974), the effect of insufficient
adjustments from starting points (i.e., anchor values) was termed anchoring and identified as one of three important heuristics. As anchoring is both a heuristic (a mental shortcut or rule of thumb, being used in judgments and decision making) and a bias (a systematic error in decisions and estimations, often as a result of heuristic thinking), both terms are used in the present thesis.

Although the anchoring paradigm mainly focuses on assimilation towards the anchor value, the opposite finding also exists; whereas assimilation refers to estimates being drawn towards an (explicit or implicit) anchor, contrast effects refers to the opposite: estimates being drawn away from the anchor (e.g., Strack & Mussweiler, 1997).

**Accounts concerning the mechanisms behind anchoring effects**

There is about as much disagreement on the causes of anchoring as there is agreement on the ubiquity of anchoring. Several accounts have been suggested to explain the effect of anchors on the subsequent estimations. The accounts differ amongst other things in regards to their view concerning the effortfulness of the process (see Chaxel, 2014, for an overview), and in their view concerning in which stage in the judgment process that anchoring occurs (see Chapman & Johnson, 2002; Wilson, Houston, Etling & Brekke, 1996, for overviews). The different anchoring accounts also differ both in regards to the cause of anchoring and the underlying processes behind it.

**Conversational inferences**

Historically, conversational inferences have been used as an explanation of anchoring effects. Without measures taken to reduce ascribed informativeness of the anchors, there is a risk that participants interpret experimenter-provided anchors as informative of the actual value. People assume others to be informative and all given information in a conversation to be relevant (Grice, 1975), and if a participant is asked to compare a target value to a suggested value, it is reasonable for them to assume that the anchor value is meaningful and indicative of the right answer. To avoid this, in most anchoring studies the participants are explicitly told that the anchor values are randomly selected and thus not indicative of the right answer. Because anchor effects still occur, despite this information, conversational inferences are, although possibly a contributing factor, hardly the main cause of anchor effects. Furthermore, conversational inferences does not explain the psychological process behind the anchor effect.
Insufficient adjustment

Tversky and Kahneman (1974) originally assumed anchoring to be caused by insufficient adjustment from the original anchor. The insufficient adjustment account assumes that estimators start from an anchor value and try to adjust towards the correct value, but do so insufficiently because of uncertainty of the true value and because they stop when they reach a value they believe to be within the range of plausible values (e.g., Epley & Gilovich, 2004; Quattrone, Lawrence, Finkel, & Andrus, as cited in Chapman & Johnson, 2002). Furthermore, adjustments are seen as effortful, and thus estimators in lack of enough effort or cognitive resources will fail to adjust enough (e.g., Lieder, Griffiths, Huys, & Goodman, 2018). However, insufficient adjustments have not been able to account for all types of anchoring, as anchor effects have been found to occur even prior to possible adjustment (Jacowitz & Kahneman, 1995), and several studies have failed to find evidence of anchoring depending on insufficient adjustment (e.g., Chapman & Johnson, 2002; Mussweiler & Strack, 1999b; Mussweiler, Strack, & Pfeiffer, 2000; Strack & Mussweiler, 1997).

In the standard anchoring paradigm, the anchors are generally provided by the experimenter, most often very explicitly, and the participants do not know whether the comparison value is true or not. In some cases, however, the anchors are self-generated (i.e., provided by the participants’ themselves), and thus known to be incorrect. Naturally, it is more common for people to be influenced by self-generated anchors (or other unrelated numbers that they recently were exposed to which easily comes to mind), than to be presented with an arbitrary value and asked to compare it with a judgment as in the standard anchoring procedure. For example, when asked to estimate the boiling point of water on Mount Everest, the normal boiling point of water would easily come to mind. In this example, the normal boiling point of water is used as a self-generated anchor, known to be wrong, but used as a reference value to start from. Epley and Gilovich (2001) found participants to in a much greater extent report using a method similar to adjustment for self-generated anchor items than for experimenter-provided anchor items.

Because adjustment is regarded as cognitively demanding and effortful, it should be reduced by variables that affect cognitive abilities. However, neither manipulations aimed to impede the ability to make effortful adjustments (e.g., time pressure and cognitive load, as in Epley & Gilovich, 2006 and Mussweiler & Strack, 1999b), nor manipulations aimed to increase the willingness to engage in effortful adjustment (Chapman & Johnson, 2002; Tversky & Kahneman, 1974; Wilson et al., 1996) influence anchoring to
experimenter-provided anchors in the standard paradigm. However, Epley and Gilovich (2001, 2006) have repeatedly demonstrated that although assimilation to experimenter-provided anchors is not affected by manipulations such as cognitive load, forewarning, incentives, and by nodding while answering the absolute question, assimilation to self-generated anchors is. Together, these findings have led to the dominant conclusion being that adjustment seems to occur in anchoring from self-generated anchors, but not in anchoring from experimenter-provided anchors (and hence not to be the major cause of anchoring to experimenter-provided anchors). However, this view is challenged by more recent accounts which have claimed that insufficient adjustment can be the cause of experimenter-provided anchors as well (e.g., Chaxel, 2014; Simmons, LeBoeuf, & Nelson, 2010).

**Numeric and magnitude priming and scaling effects**

In some cases, mere exposure to a numeric anchor without explicit instructions to compare the target answer to the anchor value, and without semantical relation to the question, is enough to produce anchor effects (e.g., Chapman & Bornstein, 1996; Wilson et al., 1996; Wong & Kwong, 2000; Oppenheimer, LeBoeuf, & Brewer, 2008). For example, the anchor value in a comparison question concerning the length of an airport runway has been shown to influence ensuing estimates concerning a semantically unrelated question concerning the cost of a new bus (Wong & Kwong, 2000), and participants ID numbers have been found to affect their subsequent estimates of the number of physicians in a book (Wilson et al., 1996). This influence of uninformative anchors without explicitly comparing the anchor to the target has by Wilson et al. (1996) been termed basic anchor effects.

In the aforementioned cases, the accessibility of numerical values near the anchor is presumed to be increased by exposure to the anchor, and anchoring in these circumstances has been attributed to pure numeric priming. In other cases, more general concepts of magnitude have been primed (e.g., Tomczak & Traczyk, 2017). For example, Oppenheimer et al. (2008) found that participants who drew a long line before estimating the length of the Mississippi river made higher estimates than participants who drew a short line, and Sleeth-Keppler (2013) argued that priming of vague quantifiers rather than numerical values explain anchoring. Numeric priming is assumed to occur early in the anchoring process – before even considering the target as a possible answer (Wong & Kwong, 2000). However, it has also been explained as a kind of backward priming, in which the anchor (in contrast to
the standard priming account) is not assumed to be activated until the attempt to answer the target question (Kahneman & Knetsch, as cited in Chapman & Johnson, 1999).

An alternative explanation of numeric anchoring is scale distortion theory, in which anchors shift the use of the response scale (Frederick & Mochon, 2012; Mochon & Frederick, 2013). According to scale distortion theory, anchors change the use of the response scale for the judgment. For example, in the example concerning the tallest oak tree in Sweden, the absolute estimates would be higher following a high anchor because the scale is both perceived and used differently in relation to a high anchor than to a low anchor. In a related mode, a recent theory by Lewis, Gaertig, and Simmons (2018) proposes that anchoring is caused by aversion to extreme adjustments, and that the presentation of an anchor value makes values far away from the anchor seem more extreme. However, findings showing that anchors affect the representation of the target object itself rather than the scale (e.g., Bahník & Strack, 2016) and that semantic similarity between the target and anchor is associated with anchoring strength (e.g., Sailors & Heyman, 2019) imply that neither scale effects nor numeric priming constitute the main explanation behindanchoring.

Numeric priming can apparently be enough to produce anchor effects (at least in some cases), but it cannot account for all anchor effects. For example, it cannot explain why anchoring is affected by the semantic relation between target and standard, or by the relation between the judgmental scale used for the comparative and absolute question (e.g., Sailors & Heyman, 2019; Strack & Mussweiler, 1997; Carroll et al., 2009). Furthermore, if anchoring was caused by pure numeric priming, absolute estimates following comparative questions should reasonably consist of the exact same value as the anchor, which they hardly ever do (Strack, Bahník, & Mussweiler, 2016).

**Semantic priming through confirmatory hypothesis testing**

The currently most dominant explanation of anchoring is that of selective accessibility through semantic priming. According to the selective accessibility account, anchors affect the subsequent estimates because participants test the hypothesis that the target value is the same as the anchor value, and because this testing increases the accessibility of hypothesis-consistent information. The idea of confirmatory hypothesis testing as a cause of anchoring (i.e., that anchors increase the availability of features that the target and standard have in common through confirmatory search) was first suggested by Chapman and Johnson (1994, 1999). Since then, there have been
several advocates of similar accounts, with the Selective Accessibility Model (SAM; Mussweiler & Strack, 1999a; Strack & Mussweiler, 1997) as the most influential thus far. The SAM is built upon a combination of hypothesis-consistent testing and semantic priming and argues that when individuals attempt to answer the initial comparative question in a standard anchoring task, they test the hypothesis that the anchor value is equal to the true value (“Is the tallest oak true in Sweden in fact 80 meters?”). Humans are inclined to confirm rather than reject hypotheses (e.g., Klayman & Ha, 1987), and this confirmatory hypothesis testing generates more information consistent with the hypothesis than inconsistent with the hypothesis. Hence, participants will selectively retrieve knowledge from memory consistent with the hypothesis (i.e., the anchor value). This process is assumed to increase the subsequent accessibility of the hypothesis-consistent information, and in turn to affect the absolute estimate. In this account, the fact that standard anchoring effects are so robust have been explained by the fact that they are produced by the estimators’ self-generated knowledge, activated by the selective hypothesis testing (Englich, 2008; Mussweiler & Strack, 1999b). Self-generated knowledge is less likely to be seen by the estimator as something that biases the judgment (Mussweiler & Neumann, 2000). Thus, judges are less likely to be aware of the influence of anchors when they perceive the knowledge they produce to be self-generated.

The semantic priming account is strengthened by several findings showing that the anchor value influences the target judgment only when it is relevant and semantically related to the judgment (e.g., Strack & Mussweiler, 1997; Bahník & Strack, 2016). In the knowledge accessibility paradigm, assimilation is assumed to be dependent on the similarity between the primed value (i.e., standard) and the target (e.g., Mussweiler, 2003; Mussweiler & Strack, 2001). In line with this assumption are several findings showing that greater semantic similarity between comparison and estimation value is associated with stronger anchoring (Sailors & Heyman, 2019); that prompting participants to consider dissimilarities between target and anchor reduces anchoring (Chapman & Johnson, 1999); and that a focus on similarities is associated with more pronounced anchor effects (e.g., Chaxel, 2014; Mussweiler, 2002). Moreover, the idea of biased retrieval of features similar to the target is supported in a study of Mussweiler and Strack (1999b), in which participants after a comparative question came to think of more features consistent with a high target value when given a high anchor, and more features consistent with a low target value when given a low anchor. Another study by the same authors (Mussweiler & Strack, 2000b) showed that
participants in a lexical decision task were faster at identifying words associated with winter weather when exposed to a low temperature anchor and faster at identifying words related to summer weather when exposed to a high temperature anchor.

**Concluding remarks on accounts concerning the cause of anchoring effects**

Several accounts argue to constitute the main explanation concerning the mechanisms behind anchoring, and there is still no consensus regarding the underlying mechanisms behind anchor effects. However, it is very possible that the different accounts are complementary and that they are involved in and can explain different parts of the anchoring process. Accordingly, Simmons et al. (2010) find several of the explaining mechanisms to be involved. Semantic and numeric priming might both affect anchoring, although in different contexts and in different stages in the estimation process. For example, Wong and Kwong (2000) suggest that numeric priming might initiate the anchoring process and semantic priming enhance it, and several researchers (e.g., Chaxel, 2014; Mussweiler & Strack, 2001; Simmons et al., 2010) suggest that both selective accessibility and insufficient adjustment are responsible for the anchoring phenomenon.

**Boundary conditions for anchoring**

For a seemingly uninformative number to be able to affect an estimation by serving as an anchor, the participant needs to pay attention to the anchor. In the standard anchoring paradigm, this is ensured by asking participants the comparative question first. However, anchors can result in anchor effects even without this explicit comparison, as long as the participants pay enough attention to the anchor (by, for example, performing computations with it, see for instance Wilson et al., 1996). Anchors are also assumed to affect subsequent estimates only if the anchors are presented on the same scale as the response should be given (e.g., Carroll et al., 2009; Chapman & Johnson, 1994).

However, standard anchor effects are very robust and several studies have shown that it is hard to make people refrain from assimilating their estimations to an anchor value (e.g., Epley & Gilovich, 2005; Joel, Spielmann & MacDonald, 2017). Attempts to decrease the effect by forewarning (Epley & Gilovich, 2005); by telling the participants to disregard from the anchor value (Mussweiler & Strack, 1999b); by offering payoff for accuracy (e.g., Tversky & Kahneman, 1974; Wilson et al., 1996); and by presenting the anchors subliminally (Mussweiler & English, 2005) have failed. Moreover,
anchor effects occur even without explicit instructions to compare with the anchor (Brewer & Chapman, 2002), and estimates are generally influenced by extreme or even unreasonable anchors (Strack & Mussweiler, 1997; Wegener, Petty, Detweiler-Bedell, & Jarvis, 2001).

As is implied in the title of the original work by Tversky and Kahneman – Judgment under uncertainty – for there to be any room for heuristics and biases to affect the judgments there needs to be at least some amount of uncertainty in the judgment. If the person making the judgment already knows the answer, or is highly knowledgeable about the subject, anchors should not have much of an effect. Hence, the anchor should only have an effect on the subsequent judgment if the decision maker is actually uncertain of the actual value of the target. Consequently, assimilation tend to occur and be strong in estimations of high uncertainty and less information (e.g., Biernat et al., 1991; Smith, Windschitl, & Bruchmann, 2013), and according to Mussweiler and Strack (2000a), the less the estimator knows about an object being estimated, the more the estimator assimilates towards the anchor value. Furthermore, Wilson et al. (1996) have demonstrated that participants who rated themselves to be knowledgeable in the target domain were less influenced by anchors than participants who rated themselves as knowing little about the domain. However, even experts are affected by uninformative anchors (e.g., Englich, Mussweiler, & Strack, 2006; Northcraft & Neele, 1987; Smith et al., 2013). Knowledge about the target may affect anchoring differently depending on the anchoring paradigm, and Englich (2008) predicts that knowledge reduces basic anchoring (i.e., assimilation towards uninformative anchors without explicit comparison) but not standard anchoring (i.e., assimilation towards explicit comparison values). Accordingly, knowledge has in several studies been shown to diminish basic anchoring effects (Chapman & Johnson, 1994; Englich, 2008; Mussweiler & Strack, 2000a; Wilson et al., 1996), but not standard anchoring effects (e.g., Englich, 2008; Englich & Mussweiler, 2001 - but see Smith & Windschitl, 2015 and Smith et al., 2013).

Anchoring has also been shown to be affected by source credibility. Although participants anchor even when they are informed that the anchor is uninformative, they show higher confidence and place greater weight on the anchor when the anchor comes from a credible (knowledgeable) source compared to a non-credible (non-knowledgeable) source (Dowd, Petrocelli, & Wood, 2014; Wegener, Petty, Blankenship, & Detweiler-Bedell, 2010), and show stronger anchor effects for relevant anchors (that are related to the estimation) than for irrelevant anchors (Glöckner & Englich, 2015).
In conclusion, although there is some agreement concerning factors related to the prevalence and strength of anchoring, and concerning the comprehensiveness of the anchor effect, it is still unclear exactly which conditions that are sufficient and necessary for anchor effects to occur.

**Assimilation and contrast in social judgments**

The anchoring paradigm has mainly concerned estimates on objective scales, such as answers to factual questions, often related to general knowledge. However, the concepts of assimilation and contrast are used in other paradigms as well, for example in the false consensus and social projection literature. The false consensus effect concerns the fact that people generally overestimate the degree of similarities between their own opinions and personalities and those of others’ (e.g., Marks & Miller, 1987; Ross, Greene, & House, 1977; Wolfson, 2000). The effect is generally studied by asking individuals to state their attitude concerning a certain subject (e.g., lending money to a friend), and then to estimate the percentage of their peers that would respond in the same way. In the literature on social projection (i.e., the tendency to expect others to be similar to oneself, see for instance Robbins & Krueger, 2005), participants are typically first asked to judge a trait of themselves (e.g., “How generous are you?”) and thereafter to judge the same trait of other individuals or groups. In the false consensus and social projection accounts, the perception of self and others is assumed to be related in a manner akin to assimilation (e.g., Biernat, Manis, & Kobrynowicz, 1997). These accounts mainly concern judgments being made on subjective scales, most often concerning judgments of own and others traits and preferences (e.g., Fagerlin, Ditto, Danks, Houts, & Smucker, 2001; Krueger & Clement, 1994; Muller, Williamson, & Martin, 2002).

The concepts of assimilation and contrast have been acknowledged for long. Sherif, Taub, and Hovland (1958) maintained already in the 1950’s that a reference point can either move the estimator towards the reference point (assimilation) or away from the reference point (contrast), and that whether assimilation or contrast effects are obtained is dependent on the distance between the anchor and the target. Several accounts have since then predicted that whether assimilation or contrast ensue social comparisons depends on the perceived similarity between the target and standard (e.g., Mussweiler, Rüter, & Epstude, 2004; Stapel & Winkielman, 1998). The Selective Accessibility Model (Mussweiler, 2003), for example, state that the first impression of general similarity or dissimilarity between the target and standard affects subsequent focus on similarities and dissimilarities between
the target and standard. If the estimator first perceives general similarity between the target and standard, this will lead to similarity testing in which similar features between the two will become more accessible (while dissimilar features between the two will tend to be disregarded), resulting in assimilation. A first impression of dissimilarity on the other hand, will lead to dissimilarity testing and increased accessibility of dissimilarities (and similarities being discarded), resulting in contrast effects. Indeed, conditions that encourage similarity testing have been found to lead to assimilation, whereas conditions that encourage dissimilarity testing leads to contrast (Mussweiler et al., 2004).

Anchoring processes have in fact been used to explain social projection (e.g., Krueger, 1998; Robbins & Krueger, 2005), and by this account, people anchor their estimates of others in their own response and adjust insufficiently when trying to predict someone else's response. Hence, social projection and standard anchoring are assumed to be based on the same principles and have been explained in the same theoretical framework, although they are rarely seen together and use somewhat different terminologies (but see Clement & Krueger, 2002; Krueger, 2007 for examples of exceptions).

Social categorization (i.e., the grouping of social targets into categories) affects both the perception and recognition of individuals (e.g., Bernstein et al., 2007; Hugenberg & Sacco, 2008). For example, categorizing an individual as an in-group or out-group member has important consequences for standard selection in social comparisons and social judgments. Accordingly, social projection is typically stronger for estimations of in-groups and in-group members compared to out-groups and out-group members (e.g., Clement & Krueger, 2002; Mullen, Dovidio, Johnson & Copper, 1992; Mussweiler & Bodenhausen, 2002; Robbins & Krueger, 2005). Although in-groups can be based on a plentitude of different social aspects, gender is one of the most salient dimensions that affects social categorization (Krueger & Zeiger, 1993; Quinn & Macrae, 2005; Zárate & Smith, 1990). Hence, individuals are more inclined to assume similarities between themselves and other individuals of the same gender or of otherwise based in-groups.

Consequently, social categorization influences the perceived similarity between social objects. In searching for relevant standards to use in estimations, people tend to search for standards that are similar to the target to be estimated. In fact, similarity has been suggested to be the main factor behind standard recruitment in social judgments (Smith & Zárate, as cited in Mussweiler, 2003). The perceived similarity between target and standard does not only affect the choice of standard; it also affects whether the estimator...
focuses on similarities or dissimilarities between the two in subsequent estimations. As mentioned earlier, according to the SAM (Mussweiler, 2003), the first impression concerning similarities between target and standard affect the activation of subsequent schemes of perceived similarities or dissimilarities.

**Anchoring in estimations of age, weight and height**

Although anchor effects are generally considered virtually omnipresent and have been demonstrated in numerous different judgmental tasks, anchor effects in the standard anchoring paradigm has predominantly been investigated in judgments related to semantic knowledge (often concerning answers to general knowledge questions) and have yet to be demonstrated in the context of estimations of age, weight and height.

In contrast to questions concerning semantic knowledge, estimations of age, weight and height are supported by concrete visual stimuli and are also regularly exercised – most people have at least some experience in making these types of judgments. Moreover, these estimates are restricted to a more narrow range and are more familiar to the estimator compared to most estimates in standard anchoring tasks. People know how old, tall and heavy human beings can become. In contrast, when asked a question about the amount of meat eaten per year by the average Swede, or the height of the tallest oak tree, most are very uncertain. Surely, they know the answer not to be lower than zero, but most people are not aware of the range of a reasonable answer to these questions. Together, these variables account for estimations of age, weight and height being made with higher certainty than most other judgments used in the standard anchoring paradigm, which indicate that they should be less influenced by anchoring than other judgmental tasks.

Furthermore, as estimations of age, weight and height involve social features, they are affected by aspects such as social desirability and status. Moreover, the social nature of the estimations makes it natural for individuals to use themselves as starting points for the estimates, as in other sort of egocentric anchoring phenomena, such as social projection. The social nature of these judgments means that they are also affected by aspects like group categorization and perceived similarity between participant and target person. Anchoring in estimations of people’s age, weight and height have mainly been studied in regards to the own-anchor effect, which refer to egocentric assimilation in estimation of age, weight and height. This phenomenon is especially interesting in the context of anchoring and assimilation in social
judgments, as it brings together theories from the different assimilation and anchoring paradigms

The own-anchor effect

The own-anchor effect concerns the assimilation of estimates of age, weight and height towards the corresponding characteristics of the estimator. Hence, the own age, weight and height of the estimator are used as an (often implicit) anchor, towards which the estimates are assimilated. The own-anchor effect is, in comparison with standard anchoring effects, not nearly as well-known or researched. Most studies on estimations of age, weight and height have not considered the effect (even studies that investigate the relation between participants own age, weight and height fail to consider the own-anchor effect, for instance Twedt, Crawford, & Proffitt, 2014), and the few that have, have not dealt with the psychological mechanisms behind it or in other manners discussed it theoretically. Not much has happened since MacLeod, Frowley, and Shepherd (1994) gave attention to the lack of theoretical understanding of the effect and called for more research on the phenomenon.

However, the association between the estimators’ own characteristics and their estimates of target persons’ characteristics has been known for long. Already in the 1950’s to 1970’s, Rethlingshafer and Hinckley (as cited in Flin & Shepherd, 1986) acknowledged the fact that estimators use their own height as a background to which they estimate the height of target persons, Mintz (1956) found children’s estimates of the age of Peter Pan to be correlated with their own ages, and Williams (1975) demonstrated that participants’ estimates of target persons’ weight and height were correlated with the participants’ own characteristics.

The studies that have focused on the own-anchor effect explicitly have found the occurrence of the effect to be rather inconsistent. For example, Ebbesen and Rienick (1998) let participants stand in front of each other and estimate the age, weight, height and other characteristics of one another. Some of the participants made their estimates immediately, while still facing the other person, whereas other participants made their estimates after 1 day, 7 days, 28 days, or in all of the occasions under repeated recall. Participants estimating the age, weight and height immediately or after a specific time interval assimilated their estimates of the age and height of the target person, but not of weight, towards their own characteristics. In contrast, participants making repeated recall estimates own-anchored in their estimates of weight and height, but not in their estimates of age. Furthermore, when Flin and Shepherd (1986) let male target persons estimate the weight and height of
male target persons that they had briefly encountered, both male and female participants anchored their height estimates in their own characteristics, although female participants did so to a lesser extent than male participants. Male participants also anchored their estimates of weight in their own characteristics, whereas female participants did not. As there were only male target persons and the female participants assimilated less in their estimates than did male participants, Flin and Shepherd concluded that own-anchor effects may be weaker for cross-gender judgments. This assumption is supported by findings by Ward (1967), showing associations between men’s height and their judgments of the height of the average man. However, there are also reports of assimilation in cross-gender estimations, at least for female participants (e.g., Flin & Shepherd, 1986; Ward, 1967).

Own-anchoring is comparable to anchoring in the standard paradigm with regards to the objective scale, but standard anchor tasks do typically not involve social judgments. Furthermore, to the extent that own-anchoring bears resemblance to standard anchoring, it is in the form of self-generated anchors, as the estimator’s characteristics in the own-anchoring context generally are not primed as an anchor, but rather are used spontaneously by the estimator. Own-anchoring is also similar to social projection as they both involve judgment of others’ characteristics and involve the same tendency to expect similarities between self and others, and as they both find this tendency to be modulated by in-group categorization. However, social projection judgments are generally made on subjective scales, whereas estimating someone’s age, weight and height is made on an objective scale. Moreover, social projection often involves traits and attitudes even more influenced by social desirability than are estimates of age, weight and height. As the own-anchor effect still lacks theoretical understanding, it is yet unclear which of the other forms of anchoring and assimilation phenomena that it is most closely related to.

Summary and purpose

A number of different systematic factors and biases, including anchoring effects, affect estimations of age, weight and height. Despite the plethora of studies on anchoring, several questions remain, especially concerning the necessary and sufficient conditions for anchor effects to occur, and concerning the theoretical understanding of the own-anchor effect. Several studies have focused on the boundary conditions for anchoring in the standard paradigm, but none have thus far explored the boundaries for the own-anchor effect. The present thesis aimed to study the circumstances under which anchors affect
estimates of age, weight and height. These estimates are special from an anchoring perspective because they, compared to judgments in the standard anchoring paradigm, are made with rather high levels of certainty and experience, and are based on visual stimuli.

Extended knowledge of how anchoring biases systematically influence estimates of age, weight and height is important for applied as well as theoretical purposes. From an applied perspective, knowledge of all variables influencing person descriptions in eyewitness testimonies is important, and factors affecting age estimates systematically (especially concerning underestimations) is of relevance to prevent selling tobacco and alcohol to minors. From a theoretical viewpoint, anchoring in estimates of age, weight and height can facilitate the understanding of the boundaries for anchoring as well as the psychological mechanisms behind the effect.
Summary of papers

Aims
The general aim of the present thesis was to investigate under what circumstances anchoring biases occurs in estimations of age, weight and height.

The specific aims for each paper were as follows. Paper I aimed to investigate whether alcohol salespersons show higher accuracy and lower biases in their age estimates than do control persons without any special expertise in age estimations. The purpose of Paper II was to investigate the prevalence of the own-anchor effect in male and female participants’ within- and cross-gender estimates of age, weight and height. Paper III aimed to study standard anchor effects in age and quantity estimations, and to explore if anchoring in these domains were modulated by source credibility and cognitive load. The main objective of Paper IV was to investigate if own-anchoring could be increased by priming the participants’ own age, weight and height as starting points in estimations of the same characteristics in others. Paper IV also aimed to replicate the findings from Paper II concerning gender differences in own-anchoring in estimation of age, weight and height, within and across gender, in both primed and unprimed estimates.

Summary of method and results

Paper I
The first paper aimed to study the effect of expertise on estimation biases and age estimation accuracy. The main research question concerned whether salespersons at the Swedish alcohol off-licence Systembolaget were more accurate in their age estimates than a control group with no similar experience in age estimation. The paper also investigated biases in terms of over- and underestimations of age, and in terms of the own-anchor effect. This was investigated in two experiments.

Method
In both experiments, the participants made their age estimates based on facial pictures of the target persons. In Experiment 1, participants were asked to estimate the age of 40 Caucasian target persons (20 women) aged 15-30 years ($M = 21.90$, $SD = 4.11$). In Experiment 2, participants estimated the age of 42 Caucasian individuals (21 women) in three age groups: 15-24, 34-46 and 56-65
years old. In both experiments, the target persons were depicted in facial pictures shown on a laptop computer, and the participants were asked to estimate the age of the target persons in a self-paced manner. In the first experiment, 20 of the participants were salespersons (13 of them female, $M = 38.10$ years, $SD = 11.86$) and 20 of the participants served as control persons (14 female, $M = 37.60$ years, $SD = 12.21$). In the second experiment, 73 participants were salespersons (41 female, $M = 38.93$, $SD = 12.71$) and 73 participants served as controls (41 women, $M = 38.95$, $SD = 12.42$). Over- and underestimates (i.e., estimation bias) were calculated as the mean of the signed deviations between target person’s age and estimated age. Accuracy was calculated as the mean of the absolute deviations between target person’s age and estimated age. The own-anchor effect was measured as the correlation between the participants’ own age and the mean of signed deviations in their age estimates.

**Results and conclusion**

Both experiments reported in Paper I suggest that the accuracy in age estimates made by salespersons is higher in relation to that of control persons, at least for target persons aged between 15-24 years. As can be seen in Table 1 and Table 2, both control persons and salespersons generally overestimated the age of the target persons in both experiments, but salespersons overestimated the age of the target persons less than control persons did. In both experiments, salespersons overestimated the age of target persons who were too young to buy alcohol, although they did so to a lesser extent than control persons did.

In Experiment 1, participants in the control group assimilated their age estimates towards their own age (hence, demonstrating an own-anchor effect), which indicate that the overestimations of the target persons’ age were not simply due to a regression towards the mean. Importantly, salespersons did not own-anchor in their age estimates, which point to the conclusion that the own-anchoring bias can be reduced by training.

Neither salespersons nor control persons own-anchored to their own age in their age estimates in Experiment 2. Female participants showed less estimation bias than did male participants, which is in line with previous findings, showing that women’s age estimates are more accurate than men’s (Nkengne et al., 2008). Moreover, the age of target persons in the oldest age groups was underestimated, whereas the age of the target persons in the two younger age groups was overestimated.
Table 1

Age estimation bias (over- and underestimates) and accuracy (absolute deviation) for Salespersons and Controls in Experiment 1

| Target age group | Salespersons | | Controls | |
|------------------|--------------|------------------|---------|
| 15-19 years      | M 3.26 1.51  | M 3.39 1.49      |
| 20-24 years      | M 0.52 1.68  | M 2.62 1.95      |
| 25-30 years      | M 3.00 4.26  | M 5.55 3.82      |

Note. Values close to zero indicate low bias and great accuracy.

Table 2

Age estimation bias (over- and underestimates) and accuracy (absolute deviation) in Experiment 2 as a function of Salespersons vs. Controls and as Males vs. Females

<table>
<thead>
<tr>
<th>Target age group</th>
<th>Salespersons</th>
<th>Controls</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24 years</td>
<td>M 0.24 1.60</td>
<td>3.37 2.79</td>
<td>3.22 2.81</td>
<td>0.78 1.76</td>
</tr>
<tr>
<td>34-46 years</td>
<td>M 3.37 2.79</td>
<td>5.70 1.42</td>
<td>5.82 1.54</td>
<td>2.94 0.88</td>
</tr>
<tr>
<td>56-64 years</td>
<td>M -1.12 3.18</td>
<td>5.18 1.47</td>
<td>-1.69 2.75</td>
<td>-2.21 3.13</td>
</tr>
</tbody>
</table>

Note. Values close to zero indicate low bias and great accuracy while negative values indicate underestimation.

Paper II

In Paper I, the participants demonstrated an own-anchor effect in their age estimates. However, the effect was only found for the control group in one of the studies, which left questions as to under which circumstances the effect occurs. Previous studies have suggested that the own-anchor effect is stronger for same-gender estimates (Flin & Shepherd, 1986; Ward, 1967), and that women assimilate in cross-gender estimates. Therefore, Paper II aimed to explore whether there are gender differences concerning participants’ tendency to own-anchor in within- and cross-gender estimates. More precisely, Paper II investigated in two studies the suggestions that own-
anchoring is stronger for within-gender estimates and that female participant’s own-anchor across gender, whereas male participants do not.

Method

To this end, in the first study, 336 individuals (169 female) estimated the age, weight and height of target persons that they had recently briefly encountered. The target persons were 40 women and 28 men who approached participants-to-be in the street to ask for directions to a nearby location. After the target person had gone out of sight, the participant was approached by another person, who asked the participant to estimate the age, weight and height of the target person. The mean characteristics of the female target persons in Study 1 were 27.0 years (SD = 6.7), 60.40 kg (SD = 7.42), and 166.00 cm (SD = 5.76). The mean age, weight and height of the male target persons were 29.7 years (SD = 8.0), 78.07 kg (SD = 11.91), and 181.39 cm (SD = 8.77). Each target persons’ age, weight and height was estimated by between 3-20 participants (with an approximately equal number of males and females).

The second study aimed to investigate the research question with a more controlled design, in which all participants (108 individuals, 54 of them female) estimated the age, weight and height of the same target persons from full-body photographs shown on a computer. Study 2 included 21 female target persons and 21 male target persons. The female target persons were 51-79 kg (M = 63.38, SD = 9.09), 158-171 cm (M = 165.67, SD = 4.33) and 20-52 years (M = 33.2, SD = 11.0). The male target persons were 61-84 kg (M = 74.62, SD = 8.22), 160-190 cm (M = 180.05, SD = 7.78) and 19-54 years (M = 34.6, SD = 12.9). In Study 2, own-anchoring was measured in the same way as in Paper I. In Study 1, own-anchoring was measured as the regression coefficients between the participants’ own age, weight and height and their estimates of the same characteristics, after the variance explained by the target persons’ actual values had been partialed out in a hierarchical regression analysis.

Results and conclusion

Study 1 did not support the notion of the own-anchor effect being stronger for within-gender estimates. Rather, as can be seen in Table 3, assimilation towards the participants’ own characteristics was more prevalent in cross-gender estimates. However, only female participants did assimilate across gender. Hence, as predicted, whereas male participants did only own-anchor in their estimates of other men, female participants own-anchored in both within- and cross-gender estimates. In Study 2, as demonstrated in Table 4, the own-anchor effect was somewhat more frequent for same-gender
estimates than for cross-gender estimates. Notably, women own-anchored more frequently than did men, in both studies.

Although the results in Paper II were inconsistent concerning the prevalence of the own-anchor effect in the three judgmental domains in the two studies reported, the expected pattern concerning gender differences was clear; male participants did only own-anchor in their estimates of other men, whereas female participants own-anchored in both within- and cross-gender estimates.

Table 3

Regression analyses of own-anchor effects in same- and cross-gender age, height and weight estimates in Study 1

<table>
<thead>
<tr>
<th>IV: Estimators’ values</th>
<th>df</th>
<th>B a</th>
<th>β a</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV: Age estimates of same-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ age</td>
<td>86</td>
<td>-.05</td>
<td>-.11</td>
<td>-1.78†</td>
</tr>
<tr>
<td>Males’ age</td>
<td>76</td>
<td>.01</td>
<td>.03</td>
<td>0.48</td>
</tr>
<tr>
<td>DV: Height estimates of same-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ height</td>
<td>86</td>
<td>-.01</td>
<td>-.01</td>
<td>-0.07</td>
</tr>
<tr>
<td>Males’ height</td>
<td>76</td>
<td>.16</td>
<td>.13</td>
<td>2.69**</td>
</tr>
<tr>
<td>DV: Weight estimates of same-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ weight</td>
<td>86</td>
<td>.05</td>
<td>.10</td>
<td>1.32</td>
</tr>
<tr>
<td>Males’ weight</td>
<td>76</td>
<td>.01</td>
<td>.01</td>
<td>0.17</td>
</tr>
<tr>
<td>DV: Age estimates of cross-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ age</td>
<td>75</td>
<td>.10</td>
<td>.20</td>
<td>3.47**</td>
</tr>
<tr>
<td>Males’ age</td>
<td>87</td>
<td>.01</td>
<td>.03</td>
<td>-0.35</td>
</tr>
<tr>
<td>DV: Height estimates of cross-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ height</td>
<td>75</td>
<td>.29</td>
<td>.21</td>
<td>2.98**</td>
</tr>
<tr>
<td>Males’ height</td>
<td>87</td>
<td>.05</td>
<td>.06</td>
<td>0.76</td>
</tr>
<tr>
<td>DV: Weight estimates of cross-gender targets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females’ weight</td>
<td>75</td>
<td>.03</td>
<td>.03</td>
<td>0.38</td>
</tr>
<tr>
<td>Males’ weight</td>
<td>87</td>
<td>.01</td>
<td>.01</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Note. IV = independent variable; DV = dependent variable.

aRegression coefficients after the variance explained by the target persons’ true values has been partialed out

†.05 < p < .10; ** p < .01
Table 4

table: Correlation coefficients for own-anchor effects in Study 2

<table>
<thead>
<tr>
<th>Target person gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>.22</td>
<td>.13</td>
</tr>
<tr>
<td>Female</td>
<td>.35**</td>
<td>.12</td>
</tr>
<tr>
<td>Height estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>.25†</td>
<td>-.07</td>
</tr>
<tr>
<td>Female</td>
<td>.17</td>
<td>.30*</td>
</tr>
<tr>
<td>Weight estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>.36*</td>
<td>.06</td>
</tr>
<tr>
<td>Female</td>
<td>.33*</td>
<td>.48**</td>
</tr>
</tbody>
</table>

† .05 < p < .10; * p < .05; ** p < .01

Paper III

The aim of Paper III was to investigate whether anchor effects in the standard anchoring paradigm (i.e., with experimenter-provided anchor values primed by comparison questions) extend to age estimation and estimation of quantities - judgments that are both supported by concrete visual stimuli (in this study depicted in photographs). As age estimations are restricted to a specific range of values which is known to the estimator, and are also generally made with higher certainty than judgments in the standard anchoring paradigm, they might be less susceptible to anchoring than other judgments. Estimations of quantities were included in the study as they likewise are based on visual stimuli, but in contrast to age estimates are not restricted to a narrow span or supported by semantic knowledge. Paper III also investigated the effect of source credibility and cognitive load on anchoring in age estimations, quantity estimations and answers to general knowledge questions. General knowledge questions were included in the study to be able to compare the effects of anchoring, cognitive load and source credibility between the different judgmental domains.

Method

The age estimations in Paper III were based on eight full body pictures of male target persons between 28-47 years of age. The estimations of quantities were
based on pictures of eight different glass containers filled with the items to be estimated (e.g., cashew nuts, beads and matches). The general knowledge task was based on eight factual questions, used in Jacowitz and Kahneman (1995), but adapted to a Swedish context. The participants were 90 women and 54 men, aged 18-49 years. For each item, the participants were first asked to decide whether the target value was more or less than a comparison value (i.e., the anchor), and thereafter to give an absolute estimate of the target value. For half of the items, a low anchor was given and for the other half, a high anchor was given.

One third of the participants (the low credibility group) were informed that the comparison values were randomly selected and thus not informative of the actual target values; one third (the high credibility group) were informed that the anchor values came from “an expert on this type of judgments”, and the last third (the control group) were not given any information regarding the origin of the anchor values. The participants estimated age, quantities and answers to general knowledge questions in a block design, with the block order counterbalanced between participants. Cognitive load was manipulated within-subjects by asking the participants for half of the items to memorize a string of consonants that they were to report after giving their estimates to the target questions.

**Results and conclusion**

Strong anchoring effects were demonstrated for all three judgmental domains (age estimation, quantity estimation and general knowledge). Hence, the results show that anchoring occurs even in domains supported by visual stimuli and made with rather high certainty (age estimation), as well as with a low level of semantic content (quantity estimation). If anchor effects in these domains were caused by consciously driven and effortful processes, they should be diminished by low credibility of the anchor source, and affected by cognitive load. As there were no interactions between anchoring and cognitive load or between anchoring and source credibility for either of the domains, the results indicate that anchoring in the two visual domains is caused by mainly automatic processes. However, the main effects of both cognitive load and source credibility verified the effectiveness of the manipulations. The similar results across the judgmental domains regarding anchoring effects and lack of effect of source credibility and cognitive load on anchoring suggest that anchoring in age estimations and quantity estimations function in similar ways as anchoring in response to general knowledge questions in the standard anchoring paradigm.
Paper IV

The fourth paper aimed to replicate and clarify the findings in paper II concerning gender differences in the prevalence of within- and cross-gender assimilation. Although it was clear from Paper II that women own-anchored across gender whereas men did not, the results were inconsistent in regards to the prevalence of the own-anchor effect in the two studies and the three judgmental domains under study. Paper IV also aimed to investigate whether it is possible to increase the own-anchor effect by priming the participants’ use of their own age, weight and height as starting points for the estimations, and, if so, if this priming affects the gender differences concerning within- and cross-gender estimates.

Method

The target persons and material were the same as in Study 2 in Paper II. Paper IV included 285 participants (145 female) in three different priming conditions. The participants were between 18-56 years old, weighed between 45-157 kg and were 154-203 cm tall. The 93 participants in the control group were asked to estimate the age, weight and height of the photographed target persons in a block order, in the same way as in Study I in Paper II. The 97 participants in the similarity priming group were first asked to state whether or not they regarded the age, weight and height (depending on the task at hand) of the target person to be about the same as their own (if their answer was no, they were asked to consider if they regarded the characteristic of the target person to be considerably different of their own), and finally to make an absolute estimate of the age, weight and height of the target persons. The 95 participants in the elaborated similarity priming group were asked to estimate the target persons’ characteristics as the number of years, kilogrammes or centimetres more or less than themselves that they considered the target persons’ characteristics to be. For comparison with the results from Paper II, own-anchoring was measured as the correlation between participants’ own age, weight and height and the corresponding mean estimated age, weight and height of the target persons. To enable hypothesis testing between groups, own-anchoring was also measured with an own-anchor index, based on the deviation between true values and estimated values, and transformed to be given a positive value if the estimate was directed towards the estimator’s value (i.e., indicating assimilation), and given a negative value if the estimate was directed away from the estimator’s value (i.e., indicating contrast).
**Results and conclusion**

Measured in the same way as previously (i.e., with correlation coefficients), the findings were in line with Paper II; women assimilated across gender, whereas men did not (see Table 5). Measured by the own-anchor index, however (as seen in Table 6), male participants did in fact assimilate across gender in some of their estimates, although they own-anchored more frequently in their same-gender estimates (as did female participants). For age and weight estimates, men’s cross-gender assimilation was demonstrated only in the elaborated similarity priming group, whereas for height estimates, it occurred in all conditions. For age and weight estimates, there were significant interactions between target gender and participant gender as shown in Figures 1a and 1b. For weight estimates, the interaction was due to the own-anchor effect being more frequent in same-gender estimates than in cross-gender estimates, whereas for age estimates, both male and female participants assimilated more in their estimates of male target persons’ than of female target persons’.

Table 5

*Correlations between participants’ age, weight and height and their mean estimates of the target persons’ age, weight and height. N = 45-52.*

<table>
<thead>
<tr>
<th>Estimation type and gender of participants</th>
<th>Male target persons</th>
<th>Female target persons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Similarity priming</td>
</tr>
<tr>
<td>Age estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>-.28</td>
<td>.003</td>
</tr>
<tr>
<td>Females</td>
<td>-.13</td>
<td>-.03</td>
</tr>
<tr>
<td>Weight estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>.15</td>
<td>.33*</td>
</tr>
<tr>
<td>Females</td>
<td>.04</td>
<td>.27</td>
</tr>
<tr>
<td>Height estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>.32*</td>
<td>.30*</td>
</tr>
<tr>
<td>Females</td>
<td>.32*</td>
<td>.07</td>
</tr>
</tbody>
</table>
Elaborated similarity priming increased the participants’ tendency to assimilate towards their estimates of age, weight and height. As can be seen in Table 7, the own-anchor effects were stronger in the elaborated similarity priming group compared to the other two groups for all three dimensions investigated. The similarity priming did not influence participants’ tendency to own-anchor their estimates.

Table 6

Mean own-anchor values and standard deviations (based on one-sample t-tests) grouped by target gender and participant gender

<table>
<thead>
<tr>
<th>Estimation type and gender of participant</th>
<th>Male target persons</th>
<th>Female target persons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Similarity priming</td>
</tr>
<tr>
<td>Age estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>1.27** (2.40)</td>
<td>1.75** (1.97)</td>
</tr>
<tr>
<td>Females</td>
<td>0.95** (1.94)</td>
<td>0.89** (2.28)</td>
</tr>
<tr>
<td>Weight estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>3.21** (2.97)</td>
<td>3.28** (4.51)</td>
</tr>
<tr>
<td>Females</td>
<td>-0.63 (3.97)</td>
<td>0.36 (4.51)</td>
</tr>
<tr>
<td>Height estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.97** (2.58)</td>
<td>1.07** (1.99)</td>
</tr>
<tr>
<td>Females</td>
<td>-0.90* (3.02)</td>
<td>-1.14** (2.29)</td>
</tr>
</tbody>
</table>

Note. Asterisks indicate significant assimilation (positive value) or contrast (negative value), according to one-sample t-tests, testing that the index value is significantly different from 0 (* p < .05, ** p < .01).
Figures 1a and 1b. Own-anchor effects in male and female participants’ estimates of male and female target persons.

Table 7

Mean own-anchor index and standard deviations for the different priming conditions

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Similarity priming</th>
<th>Elaborated similarity priming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age estimates</td>
<td>0.82** (2.10)</td>
<td>0.40* (1.90)</td>
<td>2.01** (1.86)</td>
</tr>
<tr>
<td>Weight estimates</td>
<td>1.71** (2.66)</td>
<td>1.62** (2.71)</td>
<td>3.76** (3.01)</td>
</tr>
<tr>
<td>Height estimates</td>
<td>0.78** (2.51)</td>
<td>0.68** (2.07)</td>
<td>2.25** (3.00)</td>
</tr>
</tbody>
</table>

Note. Asterisks indicate significant assimilation (positive value) or contrast (negative value), according to one-sample *t*-tests, testing that the index value is significantly different from 0 (* *p* < .05, ** *p* < .01).

Ethical considerations

All participants took part in the experiments under informed consent. All target persons consented for their photographs to be taken and used for scientific purposes. Although target persons not comfortable with their weight or height may have felt uncomfortable with others estimating their characteristics, they were informed that their actual age, weight and height would not be revealed to the participants, and they were never exposed to the participants’ estimates of their characteristics. The empirical findings and conclusions from the papers included here are not assumed to have any ethically relevant consequences.
Discussion

Summary of main findings
The present thesis is focused on anchoring biases in estimations of age, weight and height based on visual stimuli. The main results concern the prevalence of anchoring biases; anchor effects were found in all studies reported, for all judgments investigated, and the findings extend anchoring biases in age estimation to include standard anchor effects. The results of Paper II and IV show that own-anchor effects are more frequent for estimates of same-gender target persons, and that women more readily assimilate across gender than do men (although when measured by the own-anchor index, in Paper IV, male participants did in fact own-anchor across gender in some cases). Paper IV also revealed that the own-anchor effect can be increased by elaborated priming of the estimators’ own age, weight and height as starting points for their estimates. Male participants’ cross-gender assimilation were demonstrated mainly when their estimations were primed. Alcohol salespersons’ estimates were associated with higher accuracy and a lower degree of biases than those of control persons (Paper I). Of special interest is the fact that control persons were found to own-anchor in their age estimates, whereas the experts on age estimation did not. This finding shows not only that it is possible to increase the accuracy in age estimates by training, but also that training can diminish anchor biases. Paper III demonstrated for the first time standard anchoring effects to experimenter-provided anchors in age estimates and quantity estimates based on concrete visual stimuli. As age estimations, in comparison to the judgments generally involved in standard anchoring tasks, are made with a higher degree of experience and certainty, these results demonstrate that the conditions under which standard anchoring effects occur are even more comprehensive than previously found.

Biases and accuracy in age estimates made by “experts”
The first experiment in Paper I demonstrated an own-anchor effect in age estimates made by control persons, but not in estimates made by salespersons. Because the salespersons were also more accurate in their estimates (and presumably more knowledgeable), this finding fits well into the assumption that anchor effects occur mainly for judgments under high uncertainty. However, no own-anchor effects were demonstrated for neither control persons nor salespersons in Experiment 2, even though the second experiment included considerably more participants. The different age spans of the target
persons in the two studies (15-30 years in Experiment 1 and 15-56 years in Experiment 2) may be a part of the explanation. Previous studies have shown that assimilation is stronger for targets that are considered as similar to the standard (e.g., Mussweiler et al., 2004; Stapel & Winkielman, 1998), and in Paper II, we found that participants own-anchored more in age estimates of target persons of about the same age as themselves. Hence, it is possible that the participants own-anchored their age estimates for subgroups of the target persons in Experiment 2, but not for all. The findings from Paper I constitute the first demonstration of the influence of expertise on the own-anchor effect, and the first study at all to investigate factors related to the strength of the effect.

The fact that knowledge can diminish basic anchoring effects has been known for long (e.g., Englich, 2008; Mussweiler & Strack, 2000a; Jacowitz & Kahneman, 1995; Wilson et al., 1996), but the finding that it can affect own-anchor effects as well is new. This finding has implications concerning the psychological process behind own-anchoring. Englich (2008) has demonstrated that knowledge affected basic anchoring effects (when anchors are primed without explicit comparison to the target, and assumed to be caused by simple numeric priming) but not anchoring in the standard paradigm (when anchors are primed through explicit comparison questions). The demonstration that knowledge effects on anchoring extend to estimates of age, weight and height, without explicit comparison questions, implies that the process behind anchoring of these estimates is more similar to numeric priming than to semantic priming.

Salespersons of alcohol are required to ask customers they perceive to be under 25 years old for identification. Therefore, the salespersons not only frequently make age estimations in their work, but also get feedback on their age estimates (at least for customers whom they ask to identify themselves). The results demonstrating higher accuracy for salespersons compared to control persons, for age estimates of target persons aged 15-24 years, suggest that the feedback the salespersons get is crucial for their training. This conclusion is in line with the results from Sörqvist & Eriksson (2007), which found training with feedback to be superior to training without feedback. Our results expand these findings by showing that training not only can increase the accuracy in age estimates, but is associated with reductions in systematic biases such as anchoring as well.
Own-anchor effects in within- and cross-gender estimates

The combined findings from Paper II and Paper IV suggest that the own-anchor effect indeed tends to be more common in same-gender estimations. Extant research has demonstrated that social projection is stronger for in-groups than for out-groups (e.g., Clement & Krueger, 2002; Mullen et al., 1992; Mussweiler & Bodenhausen, 2002; Robbins & Krueger, 2005). Social projection have several aspects in common with own-anchoring, and as gender is a strong determinant for in-group categorization (e.g., Quinn & Macrae, 2005; Zárate & Smith, 1990), and projection to gender in-groups have been found to be stronger than to gender out-groups (e.g., Krueger & Zeiger, 1993), it is reasonable to assume that the higher frequency of own-anchor effects in own-gender estimates are caused by higher assimilation in gender-based in-groups.

Although both men and women own-anchor more in their within-gender estimates, cross-gender assimilation do occur. Paper II was the first to show that women assimilate across gender, whereas men do not, in a design with both male and female participants and both male and female target persons. Paper IV refined these findings by showing that male participants do in fact assimilate across gender in some cases, although more rarely than female participants. Hence, the compiled results from Paper II and IV indicate that cross-gender assimilation for the most part is restricted to female estimators. So why do female participants readily assimilate across gender, while male participants most often do not? A possible explanation concerns findings indicating that when it comes to self-esteem and self construal, women tend to compare themselves with both women and men (Guimond, Chatard, Martinot, Crisp, & Redersdorff, 2006; Martinot, Redersdorff, Guimond, & Dif, 2002), whereas men tend to compare themselves mainly with other men (Major, Sciacchitano, & Crocker, 1993). The results from Paper II and Paper IV point to the possibility that this tendency may apply to own-anchoring in estimates of age, weight and height as well. As similarity comparisons are assumed to be a cause of anchoring (e.g., Mussweiler, 2003), women’s stronger tendency to compare themselves with both genders may at least partly explain their more frequent cross-gender assimilation.

However, as women and men differ systematically in terms of their weight and height (i.e., men are generally taller and heavier than women are), differences in assimilation to gender-based in-groups for weight and height estimates may also be caused by male and female participants comparing themselves with people they are more similar to on the judgmental domain,
rather than comparing themselves to people in their own (gender-based) in-
group.

As discussed in Paper II, age is not gender-linked and there is thus no
logical reason to estimate the age of others by comparing to ones’ own age for
one gender and not the other. Consequently, in both Paper II and Paper IV,
the higher frequency of assimilation for within-group estimations was mainly
demonstrated for estimates of weight and height. In Paper II, we analysed
assimilation in own-age in-groups and found own-anchor effects in younger
participants’ estimates of younger target persons (but not in that of older
target persons), and in older participants estimates of older target persons
(but not of younger target persons). These results point to the conclusion that
perceived similarity between estimator and target person, rather than social
categorization, lies behind assimilation for within-gender estimates being
more frequent. This is in line with other studies (e.g., Strack & Mussweiler,
1997; Stapel & Winkielman, 1998) that have found relevant similarity to
influence whether assimilation (or contrast) occurs. As similarity and social
categorization often go hand in hand in these variables, the two explanations
are hard to disentangle based on the studies reported here. Perceived
similarities on the judgmental domain can however not explain why women
are more inclined to assimilate across gender than are men.

The own-anchor effect has important applied implications in eyewitness
testimonies, as eyewitnesses may assimilate their estimation of the
perpetrator’s age, weight and height towards their own characteristics.
Although similar estimator biases are hard to avoid, it is important for the
juridical system to gain knowledge about the own-anchor effect as a bias
systematically affecting estimations of age, weight and height.

**Priming of the own-anchor effect**

In Paper IV, we found that elaborated similarity priming increased the
participants’ tendency to anchor their estimates of age, weight and height in
their own characteristics. The elaborated similarity priming consisted of
asking the participants to estimate the age, weight and height of the target
persons in terms of how many years, kilogrammes and centimetres more or
less than themselves they estimated the target persons to be. The participants
may have used different strategies to solve this task; they may have estimated
the target person’s characteristics first, and thereafter have calculated the
difference between their estimate and their own characteristic, or they may
have made their estimate directly in the relative manner. It is not yet clear if
both of these strategies increase the own-anchor effect, or exactly how the
priming actually influenced the estimates of age, weight and height. However, the finding that own-anchor effects are susceptible to priming may have important consequences in eyewitness contexts.

The less elaborated similarity priming did not increase the participants’ tendency to own-anchor their estimates of age, weight and height. As proposed by the Selective Accessibility Model (Mussweiler, 2003), similarity testing leads to assimilation and dissimilarity testing leads to contrast. Although the priming question (concerning whether the estimators regarded the target persons to be of about the same age, weight and height as themselves) was meant to prime similarity, as it was posed in an open format, it may have primed similarity for some participants and dissimilarity for other participants. A more direct manipulation (for example, asking the participants explicitly to consider similarities between themselves and the target persons) might have influenced the assimilation more, but such a blunt manipulation would on the other hand be less relevant, at least from an applied perspective.

Additionally, as the anchors resulting in the own-anchor effect are self-generated, they are only used in cases where the estimator perceives them as useful, which is hard to experimentally control. In some cases, estimators may use other individuals as a reference to base their estimations on rather than themselves, especially in cases where the target person’s characteristics differ a lot from their own characteristics. Answers from an unpublished study, in which we asked the participants which strategy they used in their age estimations, and if they based their age estimations on comparisons, indicate that it is common to use familiar others’ age as a reference in age estimations. Other’s characteristics may thus serve as an alternative anchor value in similar estimation tasks. More knowledge is associated with higher availability of alternative anchors (Englich, 2008), and even without knowing someone’s actual characteristics, people still have a lot of related relevant knowledge and several alternative anchors. The existence of alternative anchors for estimations of age, weight and height may thus at least partly explain why the less elaborated form of priming was insufficient to increase own-anchoring, and why the occurrence of the own-anchor effect in earlier studies has appeared rather inconsistent.

**Standard anchoring effects in age estimation**

The findings from paper III demonstrate that anchoring in age estimates is not limited to the own-anchor effect – age estimates are also susceptible to standard anchoring effects. Hence, the results from Paper III extend research
on standard anchor effects by demonstrating anchoring to experimenter-provided anchors in estimation of age and quantities. Uncertainty in the value to be estimated is a prerequisite for anchoring, and age estimations are made with higher certainty and experience than the tasks most commonly used in the standard anchoring paradigm, as well as restricted to a narrow span known to the estimator. Furthermore, both age estimation and quantity estimation involve estimations based on concrete visual stimuli. Hence, the demonstration of anchoring in the two new domains in Paper III expands the boundaries of anchor effects further by showing that anchoring occurs even for estimations based on concrete visual stimuli, made with relatively low levels of uncertainty, and based on rather narrow scale spans known to the estimator.

The main effects of both cognitive load and source credibility in Paper III indicate that both manipulations were efficient. Because cognitive load influenced the estimates (presumably by reducing the participants available cognitive resources for the estimations), but did not affect the magnitude of the anchoring effect, anchoring in this study cannot be attributed to processes that are highly demanding of cognitive resources. The findings that source credibility influenced the estimates but did not influence the amount of anchoring is consistent with this view – if participants were explicitly and consciously considering the anchor as a possible correct value, anchoring should have been diminished by information about the anchor value being randomly selected. Hence, the absence of effects of both cognitive load and source credibility on anchoring in Paper III implies that anchoring in these cases stems from processes that are not highly demanding of cognitive resources, and thus processes that are rather automatic and implicit.

Standard anchoring effects on age estimations may have important applied implications. Eyewitnesses are often asked to estimate the age of witnessed perpetrators, and if they hesitate in making this estimation, the police might ask them to compare the perpetrator’s age to a certain age interval or person, which would probably serve as an anchor that would influence the witness’s age estimate.

Limitations and future directions
From the results of Paper IV, we have learned that it is possible to increase the own-anchor effect by priming. However, we still do not know exactly how the priming worked and what the boundary conditions for priming of anchor effects are. To extend such knowledge, further research should investigate whether it is possible to increase anchoring in the standard paradigm as well,
and explore which characteristics of the manipulation that were necessary and sufficient to increase anchoring.

In Paper II, the prevalence of own-anchoring for within- and cross-gender estimates differed for age estimates in comparison to the other two judgmental domains, whereas in Paper IV, height estimates were distinguished from the other two types of judgments. Age is distinctive in comparison to weight and height as it is not gender-linked, which may explain the differing results for age estimations in Paper II. Height estimation however, is distinctive from estimation of age and weight only in the sense that it was made with somewhat greater accuracy in Paper IV, but that can hardly explain the fact that male participants own-anchored in their cross-gender estimates of height, and even did so more strongly than in their within-gender estimates.

Importantly, the own-anchor effect is not nearly as robust as anchor effects in the standard paradigm. Even though possible knowledge effects and individual differences may obscure results in the standard anchoring paradigm as well, the classical setting in standard anchoring tasks is straightforward - one group is exposed to a low anchor to a difficult question, another is exposed to a high anchor, and they respond correspondingly. The own-anchor paradigm is more complicated in several regards. First, because the anchors consist of the participant’s own characteristics, the design and analysis are more complex. Secondly, anchoring and assimilation are dependent on the perceived similarity between targets and standards. Consequently, own-anchor effects should vary according to not only the actual age, weight and height (and gender) of both estimator and target person, but also according to the perceived value of these characteristics. Thus, some of the found inconsistencies concerning which judgments (age, weight and height) and which situations (within- and cross-gender estimations) the effect occurs in may very well be caused by differences in perceived and actual differences between estimators and target persons. In some cases the estimators may base their estimations on alternative anchor values instead, such as other individuals’ characteristics. The difficulty in controlling such factors makes the own-anchor effect more complicated to study, and at the same time stresses the importance of replications of the findings reported here.

The own-anchor phenomenon is special in the sense that it brings together theories from the different assimilation and anchoring paradigms. Research on influencing factors behind own-anchoring is still sparse, and the effect has not yet been theoretically assigned in relation to other anchoring and assimilation paradigm. Hence, it is currently still not clear in detail how the
own-anchor effect is related to other similar phenomena, such as standard experimenter-provided anchoring effects, self-generated anchor effects and social projection. However, the fact that the effect is susceptible to training implies that it may be more similar to basic anchoring than to standard anchoring (Englich, 2008). Furthermore, the fact that own-anchoring differs for within- and cross-gender estimates bears resemblance to the in-group/out-group distinction in social projection. To be able to conclude which processes lies behind own-anchor effects, future studies should investigate the effects of manipulations such as cognitive load and source credibility on the own-anchor effect. As different types of anchoring effects in estimates of age, weight and height may interfere with each other, further research on the psychological processes behind anchoring would benefit from studies trying to isolate the different forms of anchor effects from each other.

There is still no consensus as to the underlying psychological mechanisms behind anchor effects. The studies reported here were not designed to test any of the competing theoretical accounts. However, findings from the studies reported here imply that the process behind anchoring biases in age estimation is predominantly implicit and automatic (i.e., not consciously controlled or highly cognitively demanding).

Concluding remarks
Although the prevalence of own-anchor effects varied for the different judgmental domains under study (age, weight and height estimations) and for different groups of participants and targets, anchor effects were found in all studies reported, for all judgments investigated. Furthermore, we have showed that it is possible to increase the own-anchor effect by priming the participants’ use of their own age, weight and height in the estimations. The own-anchor effect is much more unstable than standard anchoring effects, and inconsistencies concerning the boundaries of the effect remain. However, it is clear that the own-anchor effect to a large extent is more frequent in within-gender estimates, and that women more readily own-anchor across gender than men do.
References


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