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ABSTRACT

Social hierarchies are a key factor shaping social dynamics. To understand the psychology underlying social hierarchies, a key question is how people evaluate their social position. The purpose of the paper is to explore this question. Four empirical studies reveal that the subjective value attributed to social position does not depend exclusively on the current position but also on the context. Specifically, the analyses show that subjective value is higher when one is accustomed to lower social positions and an improvement in position is weighted more when one's positions have fluctuated less in the past. These observations fit with a model postulating two parameters: a reference point, in comparison to which one's position is appraised as satisfying or dissatisfying and an uncertainty parameter, which determines how much discrepancies from the reference point are weighted. Altogether, the paper offers the first empirical and theoretical investigation of how people evaluate social position.

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1. Introduction

Cultures vary greatly regarding how much its members care about social hierarchies as well as regarding whether different social positions are acknowledged by formal titles or are embodied implicitly by the way social interactions unfold (Fiske et al., 2016; Grusky, 2014; Van Kleef & Cheng, 2020; Von Rueden, 2014). Yet, anthropologists have recognised traces of social stratification in virtually all societies scrutinised, leading them to the conclusion that social hierarchies are universal within human communities (Von Rueden, 2014). On this basis, understanding how people perceive social positions is an important research question.

Broadly speaking, the processes underlying perception of social position can be broken down into two components. The first is inferential, and consists in estimating one's position based on integrating prior beliefs and novel information (Mattan et al., 2017). For instance, after receiving a mark at school, a student may try to infer how her performance stands in comparison with the performance of her peers. The second component underlying the perception of social position is evaluative: once a person has estimated her position in the social context, she will appraise it as satisfying or dissatisfying. This form of evaluation will elicit certain affective reactions and guide subsequent behaviour (Knight & Mehta, 2014; Steckler & Tracy, 2014).

What does research know about the evaluation of social position? In psychology and economics, there is substantial literature exploring how, generally speaking, evaluation works (e.g. Glimcher et al., 2009; Vlaev et al., 2011). Yet, by and large, this literature has neglected the domain of social position. Hence, how people evaluate social position remains to be explored. The present paper aims to offer a first step to address this question. The analysis begins by proposing an extension of previous theories of evaluation to the domain of social position. Next, the theories' predictions will be tested in four empirical studies.

2. Theory

To begin with, a precise definition of the concept of social position is needed. This can be defined as corresponding to the position one currently occupies vis-à-vis other people within a social context. This definition emphasises some important aspects. First, the construct of social position can be quantified by a number reflecting one's standing within a hierarchy. Mathematically, this number corresponds to the rank associated with the position occupied. For, instance, in a race among ten runners, the athletes arriving first, second, and third can be assigned a position number equal to ten ($P = 10$), nine ($P = 9$), and eight

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($P = 8$), respectively.[1] Second, the hierarchy in question is social, implying that one's position is relative to where other people stand within the hierarchy. Third, social hierarchies are interpreted as being context-dependent: the same person may achieve a high position in one context, for example when winning a sport race, while occupying a low position in another context, such as in the workplace or at school. Fourth, this definition implicates that ones' social position can vary over time, highlighting its dynamic nature: for instance, an athletes' position typically changes various times during a sport championship.

This definition can be used to explore how people evaluate social position. To this aim, contemporary theories of evaluation offer insight on how the problem can be framed (e.g. Glimcher et al., 2009; Vlaev et al., 2011). As illustrated below, a key aspect shared by contemporary theories is the notion that evaluation is context-dependent (Luoie et al., 2015; Palminteri & Lebreton, 2021; Rigoli, 2019; Stewart et al., 2006). The value attributed to an outcome, according to this view, strongly depends on the context wherein the outcome is experienced; more precisely, it depends on how the outcome compares with respect to other potential stimuli associated with the ongoing context. For instance, how frustrating an extra expense of £10 is depends strongly on the context. Such extra expense is enormous when one is buying coffee, while being negligible when one is buying a car. This raises the following question: do analogous context-effects occur during the evaluation of social position? And, if so, how do they look like? As illustrated below, regarding the latter question different theories make divergent predictions.

In what follows, alternative theories of evaluation will be overviewed and extended to explain evaluation of social position. It is important to stress at the outset that the purpose here is not to compare the different theories against one another in a systematic fashion—this would require a much more extensive work to be conducted also outside the domain of social position. Rather, the purpose is to use the theories as conceptual tools to tackle the problem of how social position is evaluated and to generate empirical hypotheses in this domain. Given this restricted goal, the theories will be presented in their simplest (and most "classical") version, in such a way that the key principles of each theory can be highlighted and assessed with regard to evaluation of social position. Note that, for virtually all theories examined below, more complex or hybrid versions have been proposed in the literature. A systematic comparison of the different theories would require also an analysis of these more sophisticated versions. However, given the purpose of the present paper, the more sophisticated versions will not be examined—as just said, the focus will be on the simplest and most classical formulations. Again, the reason is that focusing on the simplest versions allows one to pinpoint the core principles of a theory and to assess these principles in the context of evaluation of social position. One last point to clarify concerns the concept of context. The literature on context effects distinguishes between two independent contextual domains that can exert an influence on judgement and evaluation (Louie et al., 2015; Rigoli, 2019). The first pertains to the *temporal* domain, that is, to the experience made in the past (e.g. the social positions a person has occupied in the past). The second pertains to the so-called *spatial* domain, that is, to information available at present (e.g. the social position occupied by people in the same room). The focus of the paper is on the temporal, not the spatial, domain, and thus the various theories presented below will be framed to reflect this focus.

2.1. Expectation-as-reference theory

The first family of models to be considered can be collectively labelled Expectation-as-reference Theory (Bell, 1985; Kőszegi & Rabin, 2006; Loomes & Sugden, 1986; Mellers et al., 1997; Walker & Pettigrew, 1984). Inspired by early research in psychophysics (Helson, 1948) and by related work in Prospect theory (Kahneman & Tversky, 1979), these models posit that the subjective value V(O) associated with outcome O (where O is a real number; e.g. the actual amount of money earned) is equal to:

$$V(O) = O - \mu$$

The parameter μ corresponds to a reference point parameter. This is interpreted as reflecting the outcome expected within the ongoing context, typically corresponding to the average across the outcomes previously collected within the context. The main implication of Expectation-as-reference theory is that subjective value V(O) is higher when the contextual average is smaller. For example, consider a context associated with outcomes [20, 30, 50, 20, 80] versus a context associated with outcomes [0, 7, 8, 5, 80]. Assuming that the reference point μ corresponds to the average of the

[1]The position number (P) depends on how many social positions are available in total, for instance on how many athletes are competing in a race. As an example, in a race among fifty athletes, the 12th position is linked with $P = 39$ (i.e. it reflects a better placement than 38 competitors), while in a race among twelve competitors, the 12th position is linked with $P = 1$ (i.e. it reflects the worse placement).

context, we obtain μ = 40 and μ = 20 for the first and second context, respectively. Following Expectation-as-reference theory, the subjective value of O = 80 will be V(O) = 80−40 = 40 and V(O) = 80−20 = 60 in the first and second context, respectively.

Extending this framework to the domain of social position is straightforward. Consider a context characterised by N possible positions (e.g. 100 finishing positions in a bicycle race). Similar to Equation 1, the subjective value V(P) linked with position P can be described as:

$$V(P) = P - \mu$$

Here the parameter μ can be interpreted as corresponding to the average position an individual associates with the context. Consider, for example, a cyclist who, in the races completed so far, has finished 25th on average (corresponding to an average position of μ = 76; remember that in this example there are 100 possible positions overall). At the race today, the cyclist has finished 15th (corresponding to a position of $P = 86$). Applying Equation 2, the cyclist's satisfaction[2] about today's outcome will be V(P) = 86−76 = 10. Compare this with another cyclist who has also finished 15th today, but whose average placement in the past was 50th (corresponding to an average position of μ = 51). For the second cyclist, today's satisfaction will be higher (V(P) = 86−51 = 35). As this example illustrates, Expectation-as-reference Theory predicts that experiencing a certain social position is more satisfying when, based on past experience, one is accustomed to lower positions.

2.2. Divisive normalisation theory

The second proposal I shall consider is Divisive Normalization Theory (Louie, 2022; Louie et al., 2013, 2014, 2015; Rangel & Clithero, 2012). Inspired by research on how neurons respond to sensory stimuli (e.g. luminance and sound) characterised by different intensity (Carandini & Heeger, 2012), the theory posits that the subjective value V(O) associated with outcome O (where O is a real number) is equal to[3]:

$$V(O) = \frac{O}{\mu}$$

The parameter μ corresponds to the average of the outcomes associated with the ongoing context. Like Expectation-as-reference theory, Divisive Normalization Theory implies that subjective value V(O) is higher when the contextual average is smaller. As above, consider a context associated with outcomes [20, 30, 50, 20, 80] versus a context associated with outcomes [0, 7, 8, 5, 80]—implying μ = 40 and μ = 20 for the first and second context, respectively. According to Divisive Normalization Theory, the subjective value of O = 80 will be V(O) = 80/40 = 2 and V(O) = 80/20 = 4 in the first and second context, respectively. It is straightforward to extend Divisive Normalization Theory to the domain of social position. Simply, the subjective value V(P) linked with social position P can be described as:

$$V(P) = \frac{P}{\mu}$$

Here the parameter μ corresponds to the average social position an individual associates with the context. Consider again the example of a cyclist who, in the races completed so far, has finished 25th on average (corresponding to an average social position of μ = 76; remember that in this example there are 100 possible positions overall). At the race today, the cyclist has finished 15th (corresponding to a position of $P = 86$). Applying Equation 4, the cyclist's satisfaction about today's outcome will be V(P) = 86/76 = 1.13. Compare this with another cyclist who has also finished 15th today, but whose average position in the past was 50th (corresponding to μ = 51). For the second cyclist, today's satisfaction will be higher (V(P) = 86/51 = 1.69). As this example illustrates, Divisive Normalization Theory converges with Expectation-as-reference theory in predicting that experiencing a certain social position is more satisfying when, based on past experience, one is accustomed to lower positions.

2.3. Logistic value theory

Another explanation of how evaluation works has been recently proposed by Logistic Value Theory (Rigoli, 2019; Rigoli & Pezzulo, 2022; Woodford, 2012). This posits the following formula to explain how the subjective value of outcome O (being O a real number) is derived:

$$V(O) = logistic\left(\frac{O - \mu}{\sigma}\right)$$

Like the theories outlined above, μ corresponds to the average outcome associated with a context. But different from other theories, Logistic Value Theory also includes an uncertainty parameter σ which corresponds to the standard deviation of the outcomes

[2]The manuscript uses the term "satisfaction" to indicate the subjective value attributed to an outcome—the higher the subjective value, the higher the satisfaction.

[3]The equation represents a simplification of the model proposed by Louie et al. (2014). The fact that the equation is simplified, though, does not affect the key implications of Divisive Normalization Theory assessed in the present paper.

associated with the context. By combining both μ and σ, the model views subjective value as corresponding to a z-score transformed by a logistic function (the employment of this function implies that subjective values are bounded between zero and one). Translating Logistic Value Theory to the domain of social position is straightforward. Replacing outcome O with social position P, exactly the same formula can be used:

$$V(P) = logistic\left(\frac{P-\mu}{\sigma}\right)$$

To assess some of the key model predictions, consider again the example of a cyclist who, over previous races, has finished 25th on average (corresponding to an average social position of μ = 76) with a standard deviation of 10 positions. At the race today, the cyclist has finished 15th (corresponding to $P = 86$). Applying Equation 6, the cyclist's satisfaction today will be V(P) = logistic((86−76)/10) = .73. Compare this with another cyclist who has also finished 15th today, but whose average position in the past was 50th (corresponding to μ = 51), again with standard deviation equal to 10. For the second cyclist, satisfaction today will be higher compared to the first cyclist (V(P) = logistic((85−51)/10) = .97). Thus, like Expectation-as-reference theory and Divisive Normalization Theory, Logistic Value Theory predicts that experiencing a certain social position is more satisfying when, based on past experience, one is accustomed to lower positions.

Yet, different from Expectation-as-reference Theory and Divisive Normalization Theory, Logistic Value Theory predicts that the contextual standard deviation plays a role too. To understand why, consider a third cyclist who also has arrived 15th today. Like cyclist two, this athlete has arrived 50th on average during past races, but, contrary to cyclist two, with a standard deviation equal to 20. For the third cyclist, satisfaction today will be V(P) = logistic((86−51)/20) = .85, which is lower compared to cyclist two. As this example illustrates, Logistic Value Theory predicts that an improvement in social position will be more rewarding for someone who is accustomed to fewer fluctuations in position.

2.4. Decision-by-sampling

Decision-by-Sampling is one of the most influential accounts of evaluation in psychology[4] (Bhui & Gershman, 2018; Brown & Walasek, 2023; Stewart, 2009; Stewart et al., 2006; Walasek & Stewart, 2015). To illustrate this theory, consider an example where, during her life, an individual has worked in four different companies receiving the following salaries: £1000, £2000, £4500, and £3000, respectively. The person is now evaluating the prospect of moving to a new job where the salary is £2500. According to Decision-by-Sampling (Stewart et al., 2006), the subjective value linked with the new salary O is equal to the relative rank of the new salary in the context of previous salaries; that is, it is equal to:

$$V(O) = \frac{K_O - 1}{K_{MAX} - 1}$$

In this example, the rank of £2500 is $K_O = 3$, because this salary is better than two previous salaries. At the same time, $K_{MAX} = 5$; this corresponds to the rank of the best salary, in this case £4500. Therefore, the model implies that the subjective value attributed to a salary of £2500 is V(O) = 0.5. From this example, it is evident that the context plays a critical role in this framework: the subjective value of an outcome is not fixed, but depends on the outcome's rank relative to the context.

Decision-by-Sampling lends itself to a straightforward extension to the domain of social position. To explain how this can be done, consider a cyclist who, in the previous four races, has finished 15th, 10th, 3rd, and 5th, and who has reached the 7th position today. How satisfied is the cyclist about today's result? To estimate this employing Decision-by-Sampling, one can use the following formula:

$$V(P) = \frac{K_P - 1}{K_{MAX} - 1}$$

Here, K_P is the rank linked with today's position P: in the example, $K_P = 3$ because today's position (the 7th) is better than two positions experienced in the past (the 15th and 10th). K_{MAX} corresponds to the rank of the best position experienced, which in this example is the 3rd position. Because overall 5 positions have been experienced (including today's position), $K_{MAX} = 5$. Applying the formula, we infer that the 7th position is associated with V(P) = 0.5. Note that, if in the past the cyclist had always experienced positions better than the 7th, the appraisal of today's result would be very different: the 7th position would look very dismal indeed (being associated with V(P) = 0).

In conclusion of this section, note that previous research applying Decision-by-Sampling to the social domain (e.g. Boyce et al., 2010; Quispe-Torreblanca et al., 2021) has assumed that subjective value (e.g. expressed in terms of life satisfaction) corresponds to

[4]Decision-by-Sampling and the following theory (Range-frequency Theory) are originally theories of judgement in general, that have been subsequently extended to the domain of value judgement.

one's social position. In this view, once social rank is estimated (e.g. once I realise that I belong to the fifth income decile), this estimation is equivalent to an evaluation—in other words, estimation and evaluation of social position are essentially the same process. This implies, for example, that a cyclist's satisfaction elicited by finishing 10th will be independent of the cyclist's positions occupied in past races. A cyclist finishing 10th accustomed to win all competitions, according to this view, will be satisfied as much as a cyclist finishing 10th who has arrived last in all previous races. In other words, this view does not contemplate the existence of context effects in the evaluation of social position. Rather than employing this view, here I have applied Decision-by-Sampling to explain evaluation of social position by relying on the original version of the theory asserting that the notion of rank refers to how the current outcome (whatever its nature, being it social position, money, etc.) ranks vis-à-vis past experience (Stewart et al., 2006). In this version, past experience counts in a way that produces context effects. This version, I argue, is more promising since it envisages the existence of context effects during evaluation of social position.

2.5. Range-frequency theory

Decision-by-Sampling is a special case of a more general framework known as Range-frequency theory (Brown & Matthews, 2011; Palminteri & Lebreton, 2021; Parducci, 1965, 1995). The latter proposes the following formula to calculate subjective value (Brown & Matthews, 2011):

$$V(O) = w\frac{K_O - 1}{K_{MAX} - 1} + (1 - w)\frac{O - MIN}{MAX - MIN}$$

Where the parameter w is bounded between zero and one. The formula corresponds to a weighted average between two terms. The term on the left, which is the same as in Decision-by-Sampling, captures the relative rank of the outcome. The term on the right, which is absent in Decision-by-Sampling, reflects the relative place of the outcome within the contextual range: MIN corresponds to the smallest outcome within the context, while MAX reflects the largest outcome. To understand the implication of including the range term, consider again a person evaluating a new salary of £2500 in the context of previous salaries being £1000, £2000, £4500, and £3000. Compare this with another individual evaluating a new salary of £2500 in the context of previous salaries being £1000, £2000, £15,000, and £3000. Note that only one feature distinguishes the two scenarios: the top salary received in the past is £4500 and £15,000 for the first and second scenario, respectively. According to Decision-by-Sampling, the subjective value attributed to the new salary of £2500 is equal for the two persons, because the relative rank of the salary is the same. Range-frequency theory, by contrast, makes a different prediction. Applying this theory, we obtain MAX = £4500 and MAX = £15,000 for the first and second person, respectively, with MIN = £1000 for both. Assuming w = 0 (i.e. removing the influence of the relative rank term), the subjective value of £2500 is V(O) = (2500−1000)/(4500−1000) = 0.6 for person one, and it is V(O) = (2500−1000)/(15,000−1000) = 0.1 for person two. Thus, contrary to Decision-by-Sampling, Range-frequency theory implies that, in addition to the relative rank, the range of outcomes characterising a context is also influential in shaping subjective value.

Generalising Range-frequency theory to the domain of social position is straightforward: it suffices to replace outcome O with P, thus obtaining the following formula:

$$V(P) = w\frac{K_P - 1}{K_{MAX} - 1} + (1 - w)\frac{P - MIN}{MAX - MIN}$$

To understand how Range-frequency theory can be applied to the domain of social position, consider again a cyclist who has reached the 7th position today and who has finished 15th, 10th, 3rd, and 5th in the past. Compare this with another cyclist who also has reached the 7th position today, but has finished 50th, 10th, 3rd, and 5th in the past. Note that there is only one difference between the two: the worse placement in the past was 15th and 50th for cyclist one and two, respectively. Insofar as the relative rank of the 7th position is equal for the two cyclists, Decision-by-Sampling predicts no difference in subjective value for the two athletes. By contrast, since the worse placement for cyclist one is better compared to the worse placement

Table 1. Theories and their equations.

Theory	Equation
Expectation-as-reference theory	$V(P) = P - \mu$
Divisive normalization theory	$V(P) = \frac{P}{\mu}$
Logistic value theory	$V(P) = logistic\left(\frac{P - \mu}{\sigma}\right)$
Decision-by-sampling	$V(P) = \frac{K_P - 1}{K_{MAX} - 1}$
Range-frequency theory	$V(P) = w\frac{K_P - 1}{K_{MAX} - 1} + (1 - w)\frac{P - MIN}{MAX - MIN}$

Note: P = current social position; μ = average of past social positions; σ = standard deviation of past social positions; K_P = rank associated with the current social position; K_{MAX} = rank of the best social position experienced in the past; MAX = best social position experienced in the past; MIN = worse social position experienced in the past.

of cyclist two, Range-frequency theory implicates that the 7th position is more satisfying for cyclist two compared to cyclist one. As this example shows, Range-frequency theory predicts that not only the satisfaction linked with one's social position depends on the relative rank of the position, but also on how the position compares vis-à-vis the highest and lowest position occupied in the past.

2.6. Summary

I have now overviewed some of the major contemporary theories of evaluation, and I have extended these to the domain of social position (see Table 1 for a summary). An assumption shared by all is that the value attributed to social position does not depend solely on one's current place within the hierarchy, but also on the context, that is, it depends on past positions experienced. Is this idea corroborated empirically? This question remains open, and the present paper aims at addressing it. Although the theories overviewed above share the idea that the context matters, they nevertheless make divergent predictions regarding the precise influence exerted by the context. On this basis, the paper also aims at comparing the distinct predictions made by the theories. In what follows, the paper reports findings from four studies that speak to these empirical questions.

3. Study 1

The goal of the first study was twofold. First, it aimed at establishing whether context-effects occur during evaluation of social position. Second, it aimed at comparing the different theories spelled out above. To this aim, Study 1 investigated the role played by the contextual average, namely, by the average across the positions experienced in the past. Based on the role attributed to the contextual average, the theories overviewed above can be split in two groups. On the one hand, Expectation-as-reference Theory, Divisive Normalization Theory, and Logistic Value Theory posit that, during evaluation, people form a representation of the contextual average implicating that the current position is appraised as more valuable when the contextual average is lower. On the other hand, Decision-by-Sampling and Range-frequency Theory do not necessarily imply that the contextual average is influential. On this basis, Study 1 employed a design where the contextual average was manipulated in such a way that Expectation-as-reference Theory, Divisive Normalization Theory, and Logistic Value Theory predicted the emergence of context effects, while Decision-by-Sampling and Range-frequency Theory implied absence of such effects.

3.1. Participants

Fifty participants (mean age = 38, $SD = 11$; 25 females) were recruited online from the Prolific website (no data were excluded). The sample size was established a priori based on a paired-sample t-test with expected effect size equal to $d = .5$, statistical power equal to $1-\beta = .9$, and two-tailed type-I error probability equal to $\alpha = .05$. This requires a sample of 44 participants, which was rounded to 50. The pre-screening procedure employed by Prolific ensured that all participants were from the UK. This and the following studies were approved by the Research Ethics Committee of City, Univresity of London (UK).

3.2. Materials and procedures

After reporting their age and gender, participants were presented with the following text:

> For answering this questionnaire, please imagine being a professional cyclist. Each year, you compete against other athletes (50 in total) in several races taking place on a weekly basis. Now, consider the following scenarios.

Next, participants were presented with two vignettes, one after the other and with the order being counterbalanced across participants. The first vignette, labelled high-average context, read as follows:

> In this scenario, imagine being cyclist Y. In the previous races, your finishing position was: 11th, 9th, 12th, 10th, 8th, 8th, 10th, 12th, 9th, 11th. Today, you have just participated to yet another race, and your finishing position has been 5th. Try to imagine how happy you would be about your position today.

Participants had to respond on a scale ranging from 1 (Not at all Happy) to 10 (Extremely happy). The second vignette, labelled low-average context, was exactly the same as the first one except that "cyclist Y" was replaced by "cyclist X" and except that the finishing positions achieved in the past were 21st, 19th, 22nd, 20th, 18th, 18th, 20th, 22nd, 19th, and 21st. Altogether, the whole experiment took approximately one minute and was rewarded with £.1.

The rationale behind this design was that, by varying the previous positions across vignettes, the average position characterising the context was manipulated. Therefore, Expectation-as-reference theory, Divisive

Normalization Theory, and Logistic Value Theory predict that the level of happiness elicited by the low-average context will be greater compared to the high-average context. By contrast, Decision-by-Sampling and Range-frequency Theory do not imply any difference across contexts. This is because today's position, the 5th, corresponds to the best position and to the maximum outcome in both contexts. This implies that, according to Decision-by-Sampling and to Range-frequency Theory, the 5th position is associated with a subjective value equal to one in both contexts, with no difference.[5]

3.3. Results

The data of all studies were analysed using paired-sample t-tests. This method is appropriate because the same participants responded to both conditions. Moreover, the order of the conditions was counterbalanced across participants, ensuring that any order effect could be controlled for. By removing the between-subjects variance, paired sample t-tests afford stronger statistical power, other things being equal. When comparing the scores for the low-average context (mean = 9.52, $SD = .79$) versus the high-average context (mean = 8.52, $SD = 1.23$), a significant difference emerged (paired sample t-test: $t(49) = 6.86$, $p < .001$, $d = .97$, 95% CI [.63, 1.30]). Broadly speaking, this supports the notion that the context matters during the evaluation of social position. More specifically, the data show that the subjective value attributed to social position, here quantified as the level of happiness, is greater when the contextual average is lower. This is in line with Expectation-as-reference theory, with Divisive Normalization Theory, and with Logistic Value Theory, but it fails to support Decision-by-Sampling and Range-frequency Theory. It is appropriate to conclude, thus, that there are circumstances where the latter two frameworks, at least in their classical formulation, struggle to explain empirical evidence concerning evaluation of social position.

4. Study 2

Expectation-as-reference theory, Divisive Normalization Theory, and Logistic Value Theory fit with the findings emerged from Study 1. The purpose of Study 2 was to explore a scenario where the predictions ensuing from these three theories diverge. As explained above, Logistic Value Theory postulates that the variability of the contextual distribution affects subjective value, while Expectation-as-reference theory and Divisive Normalization Theory do not. On this basis, Study 2 employed a scenario similar to Study 1 but where the contextual variability, rather than the contextual average, was manipulated. In this scenario, Logistic Value Theory, but not Expectation-as-reference Theory nor Divisive Normalization Theory, predicts the emergence of context effects.

4.1. Participants

Fifty participants (mean age = 38, $SD = 12$; 25 females) were recruited online from the Prolific website (no data were excluded). As for Study 1, the sample size was established a priori based on a paired-sample t-test with expected effect size equal to $d = .5$, statistical power equal to $1\text{-}\beta = .9$, and two-tailed type-I error probability equal to $\alpha = .05$. This requires a sample of 44 participants, which was rounded to 50. The pre-screening procedure employed by Prolific ensured that all participants were from the UK.

4.2. Materials and procedures

As in Study 1, participants were exposed to two vignettes, presented sequentially and ordered in a counterbalanced way across participants. The vignettes were the same as in Study 1 except for the following changes:

- For both vignettes, the finishing position for today's race was the 9th.
- For one vignette, labelled high-variability context, the past positions were 20th, 10th, 15th, 10th, 20th, 15th, 10th, 20th, 20th, 10th.
- For the other vignette, labelled low-variability context, the past positions were 16th, 14th, 15th, 14th, 16th, 15th, 14th, 16th, 16th, 14th.

Note that the average past position is the 10th for both vignettes. Thus, Expectation-as-reference theory and Divisive Normalization Theory predict that participants' scores will be equal across contexts. Note, moreover, that Decision-by-Sampling and Range-frequency Theory do not implicate any context effect in this

[5]Let us spell out why Decision-by-Sampling and Range-frequency Theory predict no difference between the two contexts. The focus will be on Range-frequency Theory since Decision-by-Sampling is a special case of the former. In the high-average context, the range is between the 12th position (corresponding to $P = 39$; remember that there are 50 possible positions in the race) and the 5th (corresponding to $P = 46$). In the low-average context, the range is between the 22nd position (corresponding to $P = 29$) and the 5th (corresponding to $P = 46$). In both contexts, eleven positions are experienced by the cyclist and the 5th is the best position experienced. Let us apply the equation of Range-frequency Theory to the high-average context: $V(P) = w\ (11-1)/(11-1) + (1\text{-}w)\ (46-39)/(46-39) = 1$. Let us apply it to the low-average context: $V(P) = w\ (11-1)/(11-1) + (1\text{-}w)\ (46-29)/(46-29) = 1$. This demonstrates that Decision-by-Sampling and Range-frequency Theory predict no difference between contexts.

scenario either.[6] This is because today's outcome, the 9th position, is the best and the maximum in both contexts, thus having the same subjective value in both. By contrast, since the contextual variability is manipulated, Logistic Value Theory predicts that participants will report a higher score in the low- compared to the high-variability context. In other words, the theory predicts that the 9th position will appear as more satisfying in the low- compared to the high-variability context.

4.3. Results

When comparing the scores for the low-variability context (mean = 8.68, *SD* = 1.19) versus the high-variability context (mean = 8.06, *SD* = 1.48), a significant difference emerged (paired sample t-test: t(49) = 3.04, $p = .004$, d = .43, 95% CI [.14, .72]). Specifically, the data show that the subjective value attributed to social position, quantified as the level of happiness, is greater when the contextual variability is lower. This observation does not fit with Expectation-as-reference theory, with Divisive Normalization Theory, with Decision-by-Sampling, nor with Range-frequency Theory. However, it is in line with Logistic Value Theory. Altogether, the latter framework alone can explain the two forms of context effects identified in the paper, that is, the effects dependent on the contextual average and on the contextual variability, respectively.

5. Study 3

The results of Study 2 fit with the notion that the contextual variability affects the subjective value of social position. However, there is an alternative explanation for these results. In Study 2, the last position in the sequence is the 10th and the 14th for the high-variability and the low-variability context, respectively. This means that the current position (the 9th) is much better than the last position experienced in the low-variability context (the 14th), but not much better than the last position experienced in the high-variability context (the 10th). What if, rather than considering the contextual variability for making their judgements, participants simply considered the last position presented in the sequence as reference point? This explanation implies higher scores for the low-variability compared to the high-variability context, which is exactly what the results show. Thus, this explanation cannot be ruled out by Study 2. The purpose of Study 3 was to examine a scenario where, instead, this explanation could be ruled out.

5.1. Participants

Fifty participants (mean age = 37, *SD* = 11; 25 females) were recruited online from the Prolific website (no data were excluded). As for previous studies, the sample size was established a priori based on a paired-sample t-test with expected effect size equal to d = .5, statistical power equal to 1-β = .9, and two-tailed type-I error probability equal to α = .05. This requires a sample of 44 participants, which was rounded to 50. The pre-screening procedure employed by Prolific ensured that all participants were from the UK.

5.2. Materials and procedures

As in previous studies, participants were exposed to two vignettes, presented sequentially and ordered in a counterbalanced way across participants. The vignettes where the same as in Study 2 except for the following changes:

- For the high-variability context, the past positions were 20th, 10th, 15th, 10th, 20th, 15th, 10th, 20th, 10th, 20th.
- For the low-variability context, the past positions were 16th, 14th, 15th, 14th, 16th, 15th, 14th, 16th, 14th, 16th.

Note that there is only one difference between Study 2 and Study 3: the last two positions in the sequence in the two contexts are reversed. Specifically, while in Study 2 the last positions for the high-variability context are the 20th and the 10th, in Study 3 they are the 10th and the 20th. Similarly, while in Study 2 the last positions for the low-variability context are the 16th and the 14th, in Study 3 they are the 14th and the 16th. This variation implies that, contrary to Study 2, in Study 3 the last position experienced by the cyclist is better for the low-variability compared to the high-variability context. If participants' scores depend on treating the last position as reference point, then the scores should be higher for the high-variability compared to the low-variability context. This is opposite to what emerged in Study 2. By contrast, if participants' scores depend on considering the contextual variability, then the scores should be higher for the low-variability

[6]Let us spell out why Decision-by-Sampling and Range-frequency Theory predict no difference between the two contexts. The focus will be on Range-frequency Theory since Decision-by-Sampling is a special case of the former. In the high-variability context, the range is between the 20th position (corresponding to $P = 31$; remember that there are 50 possible positions in the race) and the 9th (corresponding to $P = 42$). In the low-variability context, the range is between the 16th position (corresponding to $P = 36$) and the 9th (corresponding to $P = 42$). In both contexts, eleven positions are experienced by the cyclist and the 5th is the best position experienced. Let us apply the equation of Range-frequency Theory to the high-variability context: $V(P) = w\ (11-1)/(11-1) + (1-w)\ (42-31)/(42-31) = 1$. Let us apply it to the low-variability context: $V(P) = w\ (11-1)/(11-1) + (1-w)\ (42-36)/(42-36) = 1$. This demonstrates that Decision-by-Sampling and Range-frequency Theory predict no difference between contexts.

compared to the high-variability context. This would replicate Study 2.

5.3. Results

When comparing the scores for the low-variability context (mean = 8.40, *SD* = 1.77) versus the high-variability context (mean = 7.70, *SD* = 1.70), a significant difference emerged (paired sample t-test: t(49) = 2.81, $p = .007$, d = .40, 95% CI [.11, .68]). This indicates that participants' scores were higher for the low-variability compared to the high-variability context. This observation is not consistent with the possibility that participants' scores arise from treating the last position of the sequence as reference point. Rather, this observation replicates Study 2 and corroborates further the notion that participants' judgements take the contextual variability into account in a way consistent with Logistic Value Theory.

6. Study 4

The purpose of Study 4 was to rule out another potential confound that may explain the findings emerged in Study 2 and 3. Imagine that, in these studies, participants based their judgements on considering the best past position and on employing it as reference point. In the high-variability context, the best past position was the 10th, while in the low-variability context it was the 14th. Thus, if this explanation is correct, then participants' scores would have been higher in the low-variability compared to the high-variability context, which is exactly what the results show. It is therefore evident that this explanation cannot be ruled out by Study 2 nor by Study 3. The purpose of Study 4 was to examine a scenario where this alternative explanation could be ruled out.

6.1. Participants

Fifty participants (mean age = 34, *SD* = 9; 25 females) were recruited online from the Prolific website (no data were excluded). As for previous studies, the sample size was established a priori based on a paired-sample t-test with expected effect size equal to d = .5, statistical power equal to 1-β = .9, and two-tailed type-I error probability equal to α = .05. This requires a sample of 44 participants, which was rounded to 50. The pre-screening procedure employed by Prolific ensured that all participants were from the UK.

6.2. Materials and procedures

As in previous studies, participants were exposed to two vignettes, presented sequentially and ordered in a counterbalanced way across participants. The vignettes where the same as in Study 3 except for the following changes:

- For the high-variability context, the past positions were 20th, 10th, 15th, 10th, 20th, 15th, 10th, 20th, 10th, 20th.
- For the low-variability context, the past positions were 20th, 10th, 15th, 14th, 16th, 15th, 14th, 16th, 14th, 16th.

Note that there is only one difference between Study 4 and Study 3: in Study 4, the positions presented first in the sequence are the 20th and the 10th for both contexts. By contrast, in Study 3 these positions were the 15th and the 14th for the low-variability context, and the 20th and the 10th for high-variability context. The changes made in Study 4 allowed me to assess the following alternative explanation: if participants' judgements arise from considering the best past position as reference point, then participants' scores should not vary across contexts. This is because now the best past position is the 10th in both contexts. By contrast, if participants' judgements arise from considering the contextual variability, then, like in Study 2 and 3, participants' scores should be higher in the low-variability compared to the high-variability context.

6.3. Results

When comparing the scores for the low-variability context (mean = 8.38, *SD* = 1.26) versus the high-variability context (mean = 7.98, *SD* = 1.55), a significant difference emerged (paired sample t-test: t(49) = 2.19, $p = .034$, d = .30, 95% CI [.02, .59]). This indicates that participants' scores were higher for the low-variability compared to the high-variability context. This observation is not consistent with the possibility that participants' scores arise from treating the best past position as reference point. Rather, replicating Study 2 and Study 3, this observation further corroborates the notion that participants' judgements take the contextual variability into account in a way consistent with Logistic Value Theory.

Finally, it is important to assess whether the position presented first in the sequence could be another potential confound. Study 2 and 3 already suggest that this is unlikely since in those studies the position presented first is the 20th and the 16th for the high-variability and for the low-variability context, respectively. If anything, this would imply a higher score in the high-variability compared to low-variability context, which is the opposite of what the results show. Study 4 eventually rules out this potential confound conclusively, since here the two contexts are equal in terms of the positions presented at the beginning of the sequence.

7. Discussion

Notwithstanding important cultural variations, there is ample evidence showing that people care greatly about their social position (Anderson et al., 2015; Cheng et al., 2010; Von Rueden, 2014). At least in some countries, the data indicate that concerns about one's social position are so relevant that they sometimes overshadow the role played by other factors (Brown et al., 2015; Clark & Oswald, 1996; Clark et al., 2009a, 2009b; Luttmer, 2005; Melrose et al., 2013). For instance, evidence from the UK reveals that, rather than being related with absolute income, people's happiness depends on how their income ranks within the social context (Boyce et al., 2010). The findings of the present paper enrich this literature by showing that the subjective value attributed to one's social position does not depend exclusively on the current position one occupies, but also on how the position is appraised with respect to contextual representations. Specifically, the data indicate that the subjective value attributed to social position is higher when one is accustomed to lower positions, and that an improvement in position is weighted more when positions have fluctuated less in the past. While failing to support various frameworks such as Expectation-as-reference Theory (Bell, 1985; Kőszegi & Rabin, 2006; Loomes & Sugden, 1986; Mellers et al., 1997; Walker & Pettigrew, 1984), Divisive Normalization Theory (Louie, 2022; Louie et al., 2013, 2014, 2015; Rangel & Clithero, 2012), Decision-by-Sampling (Bhui & Gershman, 2018; Brown & Walasek, 2023; Stewart, 2009; Stewart et al., 2006; Stewart & Walasek, 2015), and Range-frequency Theory (Brown & Matthews, 2011; Palminteri & Lebreton, 2021; Parducci, 1965, 1995), these observations fit with Logistic Value Theory (Rigoli, 2019; Rigoli & Pezzulo, 2022; Woodford, 2012). The latter postulates two parameters: a reference point, in comparison to which one's social position is appraised as satisfying or dissatisfying, and an uncertainty parameter, which determines how much discrepancies from the reference point are weighted.

Although the data presented here are at odds with various theories, this does not imply that these theories should be discarded altogether, for various reasons. First, here the focus is restricted to the domain of social position. A systematic comparison of the theories requires to extend the enquiry to domains outside social position. Second, the simplest and most classical formulations of the theories have been used here. The literature presents more complex and sophisticated versions, especially concerning Decision-by-Sampling (Bhui & Gershman, 2018; Brown & Matthews, 2011; Brown & Walasek, 2023; Ronayne & Brown, 2017; Wort et al., 2022). By making additional assumptions, these more sophisticated versions may be able to account for the effects observed here, a question that remains open for future research. Third, all these theories have received extensive support in the literature and a much more extensive comparison is needed to arbitrate among them conclusively.

Note that some previous studies have employed Decision-by-Sampling to investigate evaluative judgments in the social domain (e.g. Boyce et al., 2010; Quispe-Torreblanca et al., 2021). The main finding emerged from this literature is that people care little about quantities expressed on a continuous scale (e.g. income, wealth, goods), but, rather, they care about their social position vis-à-vis other people. For example, a study found that a person's happiness does not depend much on income per se, but, rather, on one's income position vis-à-vis other people (e.g. one's income decile) (Boyce et al., 2010). It is important to stress that the question of whether people care about continuous variables or about social position (addressed by the research just mentioned) is different from the question of how people evaluate social position and of whether this evaluation is subject to context effects (which is the question investigated in the present paper). To see why the two questions differ, consider the study of Quispe-Torreblanca and colleagues (2021). The authors found that the effect of income on life satisfaction is stronger in countries where the income distribution is more equal. This is compatible with the notion that people do not care much about income as such, but about their income decile. Indeed, the same difference in income reflects a greater difference in income decile when a country is equal compared to when a country is unequal. This finding pertains the question of whether people care more about income or about social position; it does not concern how a person evaluates her social position. For example, if we consider two persons both occupying the fifth income decile, do they report different life satisfaction based on their standards in terms of income decile (e.g. if the first person has grown up in a family belonging to the first income decile while the second person has grown up in a family belonging to the tenth income decile)? Decision-by-Sampling has never been applied to investigate this sort of question, which is the one addressed in the present paper.

It is important, finally, to highlight some limitations of the research presented here. First, given the employment of vignettes describing hypothetical scenarios, the ecological validity of the studies is limited. Assessing whether the same findings emerge in more ecological conditions is a promising research avenue, for example

by asking real athletes to rate their level of happiness after they have concluded a game. Second, the outcome measure was based on a single item. A limitation of this approach is that the internal reliability of the scale cannot be established. Third, the outcome measure is self-reported happiness. It remains to be established whether the same effects emerge also when behavioural measures such as choice behaviour or emotional reactions are assessed. Finally, participants are not representative of the population as they are based on opportunity samples recruited online. Moreover, participants come from a single country, the UK. Replicating the findings in more representative samples and in other geographical regions would be a valuable research endeavour.

In conclusion, the paper investigates the psychological mechanisms underlying the processing of social position. Prior research on this topic has highlighted the central role played by perception of one's social position in shaping people's physical and mental wellbeing (Marmot, 2005). A possibility is that the way social position is evaluated may contribute to explain the ensuing effects on wellbeing. If this is the case, then understanding how evaluation of social position works is particularly important. By shedding light on the critical role played by contextual effects in shaping the evaluation of social position, the present paper offers a first empirical and theoretical investigation of this topic.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data analysed in Study 1, 2, 3 and 4 are available as Supplementary Material.

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