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“So Happy I Could Shout!” and “So Happy I Could Cry!” Dimorphous expressions represent and communicate motivational aspects of positive emotions

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ABSTRACT

Happiness can be expressed through smiles. Happiness can also be expressed through physical displays that without context, would appear to be sadness (tears, downward turned mouths, and crumpled body postures) and anger (clenched jaws, snarled lips, furrowed brows, and pumped fists). These seemingly incongruent displays of happiness, termed dimorphous expressions, we propose, *represent* and *communicate* expressers' motivational orientations. When participants reported their own aggressive expressions in positive or negative contexts, their expressions represented positive or negative emotional experiences respectively, imbued with appetitive orientations (feelings of wanting to go). In contrast, reported sad expressions, in positive or negative contexts, represented positive and negative emotional experiences respectively, imbued with consummatory orientations (feelings of wanting to pause). In six additional experiments, participant observers interpreted that aggression displayed in positive contexts signalled happy-appetitive states, and sadness displayed in positive contexts signalled happy-consummatory states. Implications for the production and interpretation of emotion expressions are discussed.

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One may produce a genuine smile when happy, and others will clearly read that smile as happiness (Darwin, 1965; Frank, Ekman, & Friesen, 1993). However, dimorphous theory of emotion suggests that for some people, in addition to the expression normatively considered congruent with their emotional experience (e.g. smiles when happy), is the display of an additional expression that traditionally would be considered incongruent with their experienced emotions (e.g. frowns and tears when happy; Aragón, 2017; Aragón & Clark, 2017a, 2017b; Aragón, Clark, Dyer, & Bargh, 2015).

Dimorphous expressions of emotion are thought to arise from a singularly valenced appraisal of a stimulus, and a singularly valenced corresponding emotional experience that produces the spontaneous display of two expressions, one normatively

considered congruent and one normatively considered incongruent with the valence of the emotion that is experienced (Aragón, 2017; Aragón et al., 2015). Congruency, as referred to here, denotes the consistency between how the valence of the emotion is perceived when the expression has no context, versus when the expression is interpreted within its original context (e.g. Carroll & Russell, 1996). For example, when an athlete is victorious he may smile, but he may also cry, that is, display a downward turned mouth and tearing eyes (Aragón, *in press*; Aragón et al., 2015; Aragón & Clark, 2017a; Fernandez-Dols & Crivelli, 2013; Fernández-Dols & Ruiz-Belda, 1995; Ruiz-Belda, Fernández-Dols, Carrera, & Barchard, 2003). With and without this winning context, the athlete's smiles consistently will be interpreted to represent a positive emotional state (Ekman & Friesen,

1971, 1982). A smile in this case is a congruent expression. A victorious athlete might also cry in this context, which is interpreted as representing a positive emotion (Aragón, *in press*; Aragón & Clark, 2017a, 2017b; Aviezer, Trope, & Todorov, 2012; Fernández-Dols & Crivelli, 2013; Fernández-Dols & Ruiz-Belda, 1995; Ruiz-Belda et al., 2003; Wenzler, Levine, van Dick, Oertel-Knochel, & Aviezer, 2016). However, when removed from context, this same expression will be interpreted as representing a negative emotion (Aviezer et al., 2012; Wenzler et al., 2016). This expression is considered incongruent because without its original context the general valence of the emotion perceived is not congruent with the general valence of the emotion that it actually represents. These two expressions are recognisable to others and within one's self as two distinct displays of emotion that occur during the emotional experience ("I smiled and I cried").

To provide just a few examples of objective observations of such expressions noted in psychological literature, some people display pain when experiencing pleasure (Fernández-Dols, Carrera, & Crivelli, 2010), smile when sad (Fredrickson & Levenson, 1998), smile when disgusted (Ansfield, 2007), smile when embarrassed (Ambadar, Cohn, & Reed, 2009), display aggression when tender toward cute beings (Aragón et al., 2015), cry when in awe of great beauty (Aragón, *in press*), appear terrified when euphoric (Steuer, 2011), cry when victorious (Aviezer et al., 2012; Fernández-Dols & Ruiz-Belda, 1995; Wenzler et al., 2016), and cry when witnessing the good deeds of others (Aragón, 2017). Dimorphous theory defined such expressions as a class of expression unto themselves (Aragón et al., 2015; Aragón & Clark, 2017b). Dimorphous expressions are theorised to arise from positive emotional experiences and from negative emotional experiences. This early investigation focused on the personal accounts and interpretations' of the dimorphous expression of positive emotions.

Early investigations into dimorphous expressions included an informal inventory of naturalistically observed dimorphous expressions. This inventory quickly revealed that diverse combinations of positive and negative expressions coupled in their dimorphous display, appeared to come about in seemingly similar contexts. For instance, when an athlete is victorious, he may either rage across the court with expressions of happiness coupled with an expression of aggression such as gritted teeth, and a clenched jaw and

fist, or he may break down into a crumpled posture and cry. Here we investigated if these two disparate dimorphous displays represented *the experience of emotions imbued by two distinct motivational orientations*, and if these two dimorphous displays *communicated emotions imbued by two distinct motivational orientations* to those who observed them.

To understand these dissimilar dimorphous expressions as described above in the case of the athlete, one might first consider that positive emotions have been categorised into two activation-type dimensions descriptively (e.g. Russell, Bachorowski, & Fernandez-Dols, 2003), behaviourally (e.g. Mogilner, Aaker, & Kamvar, 2012), and neurologically (Berridge & Kringelbach, 2015). Multiple theories with substantial conceptual overlap have converged on these dichotomous-type dimensions to emotion, such as the dimensions of activation and deactivation (Russell, 2003), excitement and calm (Mogilner et al., 2012; Nenkov & Scott, 2014), excited and peaceful happiness (Tsai, Knutson, & Fung, 2006), high and low states of action readiness (Frijda, Kuipers, & Terschure, 1989), high and low arousal (Bradley & Lang, 1994; Feldman Barrett, 1998), dominance and submissiveness (Bradley & Lang, 1994), and appetitive and consummatory aspects of pleasure (Berridge & Robinson, 2003).

We suspected these two activation-type dimensions might underlie the disparate dimorphous expressions that we sought to explain. For these initial investigations we aimed for the broadest accommodation of these multiple overlapping conceptualisations, and operated under the fundamental motivational orientations of "wanting to go" and "wanting to pause". This investigation used the terms *appetitive* and *consummatory* taken from affective neuroscience investigations into the drive for – and experience of – pleasure because their definitions most closely paralleled our conceptualisation of these fundamental orientations (Berridge & Kringelbach, 2015; Berridge, Robinson, & Aldridge, 2009).

Appetitive orientations are rooted in wanting, agitation, restlessness, pursuit, and a drive toward incentives or desired end states. Appetitive orientations were consistent with our concept of the fundamental orientation of feelings of "wanting to go", "wanting to move", and "wanting to accelerate". In contrast, consummatory orientations are rooted in liking and the hedonic experience of pleasure. Inherent to the experience of pleasure is pausing enough from one's pursuit to be focused in on one's own experiential

senses. In this sense, consummatory orientations were consistent with our concept of the fundamental orientation of feelings of “wanting to pause”, “wanting to stop”, and “wanting to be still”.

Returning to the idea of dimorphous expressions, appetitive and consummatory orientations might reflect not only the substrate of the emotion that one is experiencing, but they might also be tightly related to the secondary expressions that arise during a dimorphous expression of emotion (e.g. the tears during tears of joy). In the example previously described, one might predict that when a tennis athlete wins a hard fought point mid-match, while still in pursuit of a future win, the experience might be one of appetitive-happiness, expressed through a dimorphous display of happiness coupled with signals of aggression such as a clenched jaw, a show of teeth, waving of fists, and loud vocalizations. These displays of happiness might be coupled with displays of aggression because real aggression and this type of appetitive-happiness might share the common substrate of feelings of wanting to go, to move or approach. Approach motivation has been associated with experienced aggression (Harmon-Jones & Allen, 1998), and has been found to be communicated by aggressive displays (Adams, Ambady, Macrae, & Kleck, 2006).

In contrast, when the same athlete later stands on the podium to receive the winning cup of the Australian Open, he or she might likely experience happiness that is of the consummatory type, marked by a release of tension, and the hedonic savouring of joy at the end of a long tournament. In this situation, one might predict that the dimorphous display would be one of happiness coupled with tears, because consummatory-happiness and sadness perhaps share the common substrate of wanting to pause, or stop in the moment (for documentation of such responses in athletes on the podium see Fernández-Dols & Ruiz-Belda, 1995). These two examples might begin to illustrate why during dimorphous expressions the normatively congruent and incongruent displays pair in the way that they do. It might be that the incongruent expression that arises is motivationally compatible to the first. Motivationally incompatible expressions (e.g. happy-tears while in a high drive state mid-match, or happy-aggression while releasing tension at the awards presentation) might not be achievable or advantageous given a person’s ongoing physiological or psychological processes.

It is reasonable to question why dimorphous expressions might come about at all. Dimorphous expressions consistently have been found to arise when emotions are intense (e.g. Ansfield, 2007; Aragón, 2017; Aragón et al., 2015; Bonanno & Keltner, 2004; Fredrickson & Levenson, 1998), and are hypothesised to possibly aid in emotion regulation through both intra- and inter-personal processes (please see Aragón & Clark, 2017b). Moreover, if dimorphous expressions do prove out to clearly communicate information about the expressers’ motivational orientations that would provide another functional purpose to their existence.

One might also wonder if what we think of as happiness displayed with expressions of anger or expressions of sadness are actually latent, or even consciously experienced anger and sadness respectively. Research by Aragón and colleagues delved into these questions in two sequences of investigations. First found was that participants reported expressions of aggression and behaviourally demonstrated displays of aggression when experiencing intense positive feelings, within the strict parameters of the absence of true aggression (Aragón et al., 2015). In a second series of investigations, after viewing deeply moving positive stories, participants reported, through both explicit measures and freely written responses, that their happiness expressed through crying reflected experiences of happiness, and not sadness (Aragón, 2017). When asked directly, “Why did you cry or feel like crying?” participants again asserted that they cried because of the good feelings that they experienced, and not because of bad feelings. Moreover, participants who reported to express their happiness through crying, directly after viewing the tear-evoking, positive video rated non-words as predominantly positive – not negative in a validated implicit test of affect (Implicit Positive and Negative Affect Test; Quirin, Kazen, & Kuhl, 2009).

Investigations thus far have demonstrated that dimorphous expressions may exist as hypothesised. The present investigation sought to replicate the findings that these dimorphous expressions can come about in positive contexts in which participants reported the experience of positive emotions. We also sought additional evidence as to what these expressions might communicate, and if those experiences and communications differed by type of dimorphous expression displayed (happiness expressed through anger-expressions and happiness expressed through sadness-expressions).

We first hypothesised about the emotional experiences represented and communicated by dimorphous expressions. We predicted that positive contexts would bring about and communicate the experience of positive emotions, and negative contexts would bring about and communicate the experience of negative emotions. More importantly to dimorphous theory, we predicted that this would be the case, even when we presented photographs that depicted expressions normatively considered negative in nature (i.e. anger-expressions and sadness-expressions) within positive contexts (for more on seemingly identical facial expressions in response to intense positive and negative emotion see, Aviezer et al., 2012).

We next hypothesised about the motivational orientations experienced and communicated during dimorphous expressions. In Studies 1 and 2 we focused on participants' motivational experiences. We tested out our hypothesis that there are commonalities in motivational substrates. Specifically, we predicted that "happiness displayed through anger-expressions" and "anger" would both represent appetitive states. We further predicted that "happiness displayed through sadness-expressions" and "sadness" would both represent consummatory states. In Studies 3 through 8 we focused on the motivational orientations communicated through dimorphous expressions. We predicted that "happiness displayed through anger-expressions" would communicate appetitive states, and we predicted that "happiness displayed through sadness-expressions" would communicate consummatory states. We report how we determined sample size, all data exclusions, all manipulations, and all measures in each study.

Study 1

Study 1 investigated if the normatively incongruent expression that arose in a dimorphous expression (anger-expression when happy, sadness-expression when happy) might be motivationally compatible to the same normatively congruent expression of emotion (anger-expression when angry, sadness-expression when sad). We projected that appetitive and consummatory orientations would be sufficiently salient to those who experienced them to be accessible for accurate self-report. Therefore, we collected participants' personal accounts of emotional experience and expression, taking into account that subjective phenomenological aspects of emotions are

considered integral aspects to emotion theory (Barrett, Mesquita, Ochsner, & Gross, 2007; Gross & John, 1997), and with the acknowledgement that self-report has thus far been a typical methodology in research into dimensions of valence and arousal (for examples see Russell & Mehrabian, 1977; Watson, Wiese, Vaidya, & Tellegen, 1999).

We manipulated emotional experience and expression in a 2 (positive context, negative context) \times 2 (anger-expression, sadness-expression) experimental design. We predicted that our positive context situations would bring about positive emotional experiences, and our negative context situations would bring about negative emotional experiences. We further predicted that happiness displayed with anger-expressions, would be more appetitive and less consummatory in nature than happiness displayed through sadness-expressions, and anger displayed with anger-expressions to be more appetitive and less consummatory in nature than sadness displayed through sadness-expressions.

Method¹

Participants

Participants were recruited online through Amazon's Mechanical Turk ($N=294$; 126 female, 167 male – one did not report gender; mean age = 35.54 years, range = 19–68, $SD=10.50$; self-reported as 76% White, 5% Black, 8% Hispanic/Latino, 9% Asian, and 2% other). Participants were compensated 25¢ for the approximate 3-min survey advertised as "2–3 minute survey. View photograph, answer questions".

Determination of sample size was made through power analysis for repeated measures, within-between interaction (G*Power software, alpha error probability = .05) calculated for 5 cells (2 \times 2 design + 1 baseline condition), with a partial eta squared effect size of 0.11 (determined by a pilot study). This analysis, and subsequent power analyses for studies reported in this paper called for approximately 50 participants per cell. All studies calculated data collection stopping rules to meet this power threshold, and all key findings report observed power.

Materials and procedure

In all studies reported in this manuscript participants first provided us with informed consent, and viewed a welcome page before being assigned randomly to condition. Study 1 design was a 2 (context: won, lost) \times 2 (expression: anger-expression, sadness-

expression), with an additional condition of won/happy-expression to serve as a baseline. All results are consistent and significant with and without this baseline condition.

Stimuli. Photographs (sized to be 400 × 450 pixels) featured the tennis players' heads, neck, and top of shoulders, and were selected from Internet searches for professional tennis players photographed on the court, who displayed smiles, tears, and aggression. Female and male models (Rafael Nadal and Victoria Azarenka) were used to be able to generalise findings to both sexes. Photographic stimuli for all studies in this paper are available from the first author. Male and female models were randomly and equally distributed between conditions in all studies reported in this manuscript.

Written above each photograph "This is a photograph of the professional tennis player Rafael Nadal. At the moment when this photograph was taken Nadal had an important win". In trials where Victoria Azarenka was depicted, her name was used instead. In trials that were meant to tap positive emotions the underlined² outcome read win (as written above). In trials that were meant to tap negative emotions, the outcome read loss. Just below the photograph participants read,

For the purpose of this exercise please suppose YOU are a famous professional tennis player. You are an important figure in the tennis world. You are known as a strong player, a good sport, and a fair competitor. Please imagine that you just won the Australian Open, an important win for you after a long fought battle. When you won, you were so emotionally involved, that you could not help but to smile. Please write below in one or two sentences how you would feel.

In the conditions where negative emotions were to be invoked, the word won or win was changed to loss or lost. In the anger-expression conditions smile was changed to yell. In the sadness-expression condition smile was changed to cry. A text box was provided for participants' open-ended responses. The purpose of the text response was to engage participants with the scenario.

Measures³. Measures listed below had the same response options of 1 = *feeling not at all*, 2 = *feeling mildly*, 3 = *feeling moderately*, 4 = *feeling strongly*, and 5 = *feeling overwhelmingly*, and were presented in randomised, counterbalanced order unless otherwise noted.

Emotional experience and expression. We asked participants, "Please answer the following questions thinking about how you would feel during this event" with individual prompts of feeling happy, feeling sad, and feeling angry. We also asked participants about the expressions they would display in such a situation, "If this really had happened, I really would have a look on my face like Nadal has above" (Azarenka), and "If this really happened, I would smile". Response options were: I definitely would not (coded -3), I probably would not (coded -1), I probably would (coded 1), and I definitely would (coded 3). **Appetitive and consummatory orientations.** Participants read, "During this event, to what extent would you feel like _____?". The appetitive orientation variable was created with averaged scores of: wanting to go, wanting to get moving, and wanting to accelerate ($\alpha = 0.90$, 3 items). The consummatory orientation variable was created with the averaged scores of: wanting to stop, wanting to pause, and wanting to be still ($\alpha = 0.89$, 3 items).

In all studies reported in this manuscript demographic questions were located on the last page of the survey. After completion, participants were thanked for their time, provided a text box with which they could express any comments, questions, or concerns, and given a debrief that explained the purpose of the experiment.

Results

All p values for *post hoc* pairwise comparisons reported in this manuscript are Bonferroni corrected. Throughout the manuscript key results are summarised in the text, and detailed results are provided for the interested reader in the Supplementary Materials.

Emotional experience and expression

When participants imagined that they had won, they reported equally high levels of happiness regardless if they were in the anger-expression ($M = 4.71$, $SE = 0.09$), sadness-expression ($M = 4.69$, $SE = 0.09$), or smile-expression ($M = 4.76$, $SE = 0.09$) condition. These participants also reported very low experiences of anger and sadness, with means for negative emotions falling in the "not at all" range, between 1.05 and 1.40 on the 1–5 scales. In contrast participants in the lost conditions reported moderate to strong anger and sadness, with anger being highest in the lost-angry-expression condition ($M = 3.75$, SE

= 0.10), and sadness being highest in the lost-sadness-expression condition ($M = 4.28$, $SE = 0.10$).

Participants in both the won-anger-expression (61%) and in the won-sadness-expression (67%) conditions indicated that they would both match the expression in the photograph and smile at equal rates, $\chi^2 = 0.49$, $df = 1$, $p = .62$. Participants in the lost-anger-expression (78%) and in the lost-sadness-expression (85%) conditions indicated at equal rates that they would both match the expression in the photograph but would *not* smile, $\chi^2 = 1.15$, $df = 1$, $p = .28$. Most participants in the baseline won-smile-expression (93%) reported that they would match the model's expression and smile.

Main analysis

Motivational orientations (appetitive and consummatory) were tested in a repeated-measures general linear model with context (won, lost) and emotional expression (anger-expression, sadness-expression, and smile-expression) entered as fixed factors. Key to this investigation, there was as hypothesised a significant interaction between emotional display and motivational orientations, $F(1, 289) = 20.00$, $p < .001$, partial eta squared = 0.12, observed power = 1.00. Participants in the anger-expression conditions ($M = 3.39$, $SE = 0.11$) reported higher appetitive orientations than those in the sadness-expression conditions ($M = 2.59$, $SE = 0.11$), $p < .001$. When considering consummatory orientations the patterns reversed. Those in the sadness-expression conditions ($M = 2.93$, $SE = 0.11$) reported higher consummatory orientations than those in the anger-expression conditions ($M = 2.02$, $SE = 0.11$, $p < .001$). This interaction between emotional display and motivational orientations was consistent whether anger-expressions and sadness-expressions manifested from dimorphous expressions (expressions of anger or sadness arising from a win) or monomorphous expressions (expressions of anger or sadness arising from a loss), as the emotional display \times motivational orientation \times context interaction was not significant, $F(1, 289) = 0.21$, $p = .65$. See Figure 1.

Study 1 discussion

Without much context, participants either imagined being winners or imagined being losers. Participants who imagined winning also reported that they would match the models' displays of aggression or sadness depending on the photographed model to

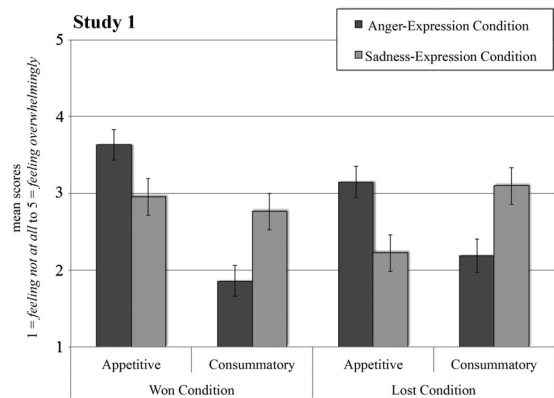


Figure 1. In Study 1 participants in anger-expression conditions reported higher appetitive orientations, than did participants in sadness-expression conditions. In contrast, participants in sadness-expression conditions reported higher consummatory orientations than did participants in anger-expression conditions. This finding was consistent both when participants imagined winning and when they imagined losing. Error bars indicate ± 2 standard errors.

which they had been randomly assigned. Moreover, their reported expressions of anger and sadness were on par with those participants who imagined losing the Australian Open. Participants were not simply agreeing to suggestions of any expression, because participants in the “won” condition reported they would smile, but participants in the “lost” condition reported they would not smile. Consistent with the theory of dimorphous expression of emotion, participants who imagined winning the Australian Open reported that they would feel strong happiness, but not anger or sadness, as those latter means and confidence intervals were within the range of “feeling not at all”. Participants in the won conditions reported a single experience of emotion, and reported two expressions of emotion (i.e. both smiles and anger-expressions; both smiles and sadness-expressions). This is consistent with the notion of dimorphous expressions of emotion.

Central to the focus of this paper and as predicted, happiness expressed through aggressive displays, and anger expressed through aggressive displays represented experiences appetitive in nature that were salient enough in their phenomenological aspects to be reported by those imagining its experience. Also consistent with our predictions, happiness expressed through sad displays and sadness expressed through sad displays, both represented experiences that were consummatory in nature. Study 1 provided support for motivational substrates to the expressions of anger and sadness, regardless of the valence of the

emotion expressed. This suggests that expression production might be more tightly linked with these motivational states than with the positivity or negativity of the emotion that is being experienced.

Study 2

Study 2 extended the results from Study 1 to the recall of one's own past real-life emotional events. Study 2 participants were assigned randomly to equivalent conditions as in Study 1, with the exception that participants were now asked "Please think about a time in which you had a similar expression during an event in your life ...".

In Study 1 our questions concerning participants' negative emotional experiences were specific to anger and sadness. We took the absence of anger and sadness as an indication of the absence of negative emotions. A concern is that happiness expressed through tears or aggression could actually represent different kinds of negative emotions, not captured by questions about sadness and anger. Therefore, to address this in Study 2 we conceptualised affect more generally in terms of positive and negative feelings, to capture the presence of any variety of negative emotions.

Method

Participants

Participants were similarly recruited and compensated as in Study 1 ($N=238$; 112 female, 126 male; mean age = 35.92 years, range = 20–76, $SD=12.47$; self-reported as 77% White, 8% Black, 6% Hispanic/Latino, 8% Asian, and 1% other).

Materials and procedure

Study 2's format closely followed the format of Study 1, with the exception that in Study 2, below the photographs, were the instructions "Please think about a time in which you had a similar expression during an event in your life that you consider to be positive. In just one or two sentences, please briefly describe the event". (They were not asked to imagine being a tennis player, as in Study 1.) In trials meant to tap negative emotions the word positive was changed to negative.

Measures. In Study 2 there were slight wording changes to rephrase our questions from how participants *would* feel as asked in Study 1, to now ask how

participants *did* feel during this recalled event. Participants again reported on their emotional experience (happy, sad, and angry), appetitive orientations ($\alpha=0.94$, 3 items), and consummatory orientations ($\alpha=0.93$, 3 items). An additional measure was added to capture the general valence of emotion experienced by the participant. Participants read, "Please answer the following questions thinking about how you felt during this event". A positive valence variable was created with the averaged scores of "positive feelings", and "feeling up", $r=0.96$, $df=236$, $p<.001$. A negative valence variable was created with averaged scores of "negative feelings", and "feeling down", $r=0.96$, $df=236$, $p<.001$. The measure of emotional expression was excluded from Study 2, as this was now redundant given that the instructions to report on experiences were defined by participants' expressions.

Results

Emotional experience

Positive event conditions designed to bring about reports of happiness did as intended (anger-expression $M=4.28$, $SE=0.09$; sadness-expression $M=4.63$, $SE=0.09$; smile-expression $M=4.36$, $SE=0.09$), as did negative event conditions designed to bring about anger and sadness (anger-expression $M=3.84$, $SE=0.11$; sadness-expression $M=4.08$, $SE=0.11$). Positive and negative valence scores reinforced these reports, as the positive event-anger-expression, positive event-sadness-expression, and positive event-smile-expression conditions did not differ from one another, and all were significantly higher in positive affect and significantly lower in negative affect than the negative event conditions. Please see [Figure 2](#).

Main analysis

Study 2 replicated Study 1, with a significant interaction between emotional display and motivational orientations, $F(1, 233)=21.42$, $p<.001$, partial eta squared = 0.16, observed power = 1.00. Participants in the anger-expression conditions ($M=3.19$, $SE=0.12$) reported higher appetitive orientations than those in the sadness-expression conditions ($M=2.26$, $SE=0.11$), $p<.001$. When considering consummatory orientations the patterns reversed. Those in the sadness-expression conditions ($M=2.76$, $SE=0.11$) reported higher consummatory orientations than those in the anger-expression conditions ($M=1.93$, $SE=0.12$, $p<.001$). This interaction between

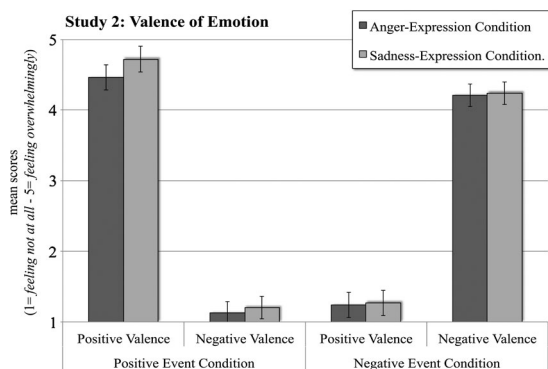


Figure 2. In Study 2 participants recalled experiencing positively valenced feelings in the positive event conditions, and negatively valenced feelings in the negative event conditions. Anger-expression and sadness-expression conditions did not differ. Error bars indicate ± 2 standard errors.

emotional display and motivational orientations was consistent whether anger-expressions and sadness-expressions manifested from dimorphous expressions (expressions of anger or sadness arising from a positive event) or monomorphous expression (expressions of anger or sadness arising from negative event), as the emotional display \times motivational orientation \times valence of event interaction was not significant, $F(1, 233) = 0.12, p = .73$. Please see Figure 3.

Discussion of Study 2

All measures in Study 2 closely replicated Study 1, providing further evidence that dimorphous expressions represent motivational orientations as gained from

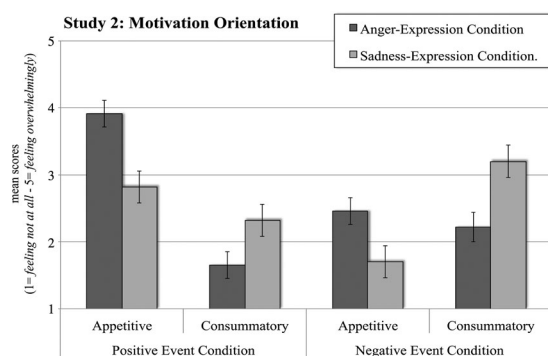


Figure 3. In Study 2 participants in anger-expression conditions recalled higher appetitive orientations, than did participants in sadness-expression conditions. In contrast, participants in sadness-expression conditions recalled higher consummatory orientations than participants in anger-expression conditions. This finding was consistent when participants recalled both positive and negative events from their lives. Error bars indicate ± 2 standard errors.

participants' own personal accounts. When participants were in the anger-expression conditions they recalled higher appetitive orientations than did participants in the sadness-expression conditions. In contrast, participants in the sadness-expression conditions recalled higher consummatory orientations than those in the anger-expression conditions. This pattern was consistent whether participants were recalling positive or negative events.

Study 3

The second thesis of this paper proposed that dimorphous expressions of happiness expressed through anger-expressions, and happiness expressed through sadness-expressions communicate predominantly happy states, but also provide observers with distinct information about expressers' appetitive and consummatory orientations. In Study 3 participants were assigned randomly to view an athlete in a winning moment displaying an anger-expression (dimorphous appetitive-happiness), displaying sadness-expression (dimorphous consummatory-happiness), or displaying a smile-expression (monomorphous happiness). We predicted that participants' inferences about the athlete in the anger-expression condition would be biased toward appetitive states, and in the sadness-expression condition would be biased toward consummatory states. We further predicted that these dimorphous expressions would provide more information about the athlete's motivational orientations than would a monomorphous smile.

Method

Participants

Participants were recruited and compensated similarly as described in Studies 1 and 2 ($N = 203$; 79 female, 124 male; mean age = 33.51 years, range = 19–74, $SD = 10.63$; self-reported as 75% White, 6% Black, 6% Hispanic/Latino, 10% Asian, and 3% other).

Materials and procedure

Stimuli. The only text-stimulus that participants read was written above the photographs (the same photographs as used in Studies 1 and 2), "This photograph is of the professional tennis player, Rafael Nadal. At the moment when this photograph was taken Nadal had an important win". In trials where Victoria Azarenka was depicted, names and pronouns were changed accordingly.

Measures. Below the photographs were the same measures as described in Study 1, with slight changes to the wording to reflect that now we were asking participants to make inferences about the tennis player's experience. Participants reported on their perceptions of the tennis players' emotions, and appetitive ($\alpha = 0.95$, 3 items) and consummatory ($\alpha = 0.95$, 3 items) orientations.

Results

Emotions communicated

In all conditions participants reported that the tennis players were experiencing happiness (anger-expression $M = 3.67$, $SE = 0.14$; sadness-expression $M = 3.76$, $SE = 0.14$; smile-expression $M = 4.24$, $SE = 0.14$). Participants in the anger-expression condition reported that the tennis player was feeling anger (means and confidence intervals fell within the "not at all" to "mildly" feeling range; $M = 2.09$, $SE = 0.10$) and participants in the sadness-expression condition reported that the tennis player was feeling sadness (means and confidence intervals fell within the "not at all" to "mildly" feeling range; $M = 1.91$, $SE = 0.11$).

Main analyses

Study 3 closely replicated Studies 1 and 2. There was again as hypothesised, a significant interaction between condition and motivational orientations, $F(1, 200) = 80.59$, $p < .001$, partial eta squared = 0.45, observed power = 1.00. Participants in the anger-expression condition ($M = 3.85$, $SE = 0.13$) inferred higher appetitive orientations than those in the sadness-expression ($M = 1.97$, $SE = 0.13$, $p < .001$), and smile-expression ($M = 2.72$, $SE = 0.13$, $p < .001$) conditions. When considering consummatory orientations the patterns reversed. Those in the sadness-expression condition ($M = 3.41$, $SE = 0.13$) inferred higher consummatory orientations than those in the anger-expression condition ($M = 1.51$, $SE = 0.14$, $p < .001$) and the smile-expression condition ($M = 2.28$, $SE = 0.14$, $p < .001$). Please see Figure 4.

Discussion of Study 3

Study 3 showed that people understand these dimorphous and monomorphous expressions much in the way that participants in Studies 1 and 2 reported them to be experienced. Participants viewed three conditions in which the context of winning in a competitive sporting event was held constant. The

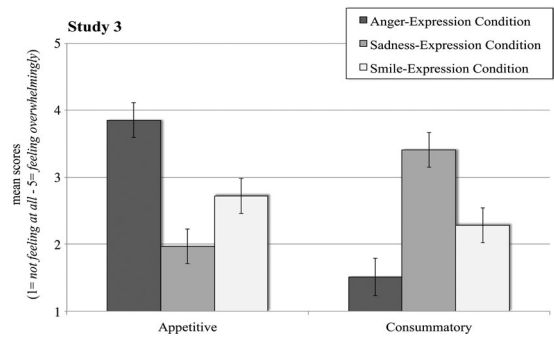


Figure 4. In Study 3 participants in the anger-expression condition inferred higher appetitive orientations, than participants in the sadness-expression and smile-expression conditions. In contrast, participants in sadness-expression condition recalled higher consummatory orientations than participants in anger-expression and smile-expression conditions. Error bars indicate ± 2 standard errors.

manipulation was the photographs that accompanied the narrative. Participants were assigned randomly to see a model of an expression normatively considered as anger, sadness, or happiness. All participants inferred that the athlete was experiencing intense happiness. Although, some participants in the anger-expression condition inferred mild anger, and some participants in the sad expression condition inferred mild sadness. This finding is addressed in greater detail in the discussion of Study 7.

As predicted, participants randomly assigned to view an anger-expression inferred higher appetitive orientations than did participants in the sadness-expression condition. In contrast, participants in the sadness-expression condition inferred higher consummatory orientations than those in the anger-expression condition. As in Studies 1 and 2, in Study 3 the means for appetitive and consummatory orientations in the smile-expression condition were in between the means of the two manipulated conditions. In Study 3 dimorphous conditions both significantly deviated from the baseline monomorphous condition. This suggests that dimorphous expressions of happiness through anger-expressions and through sadness-expressions provided participants with nuanced information about the expresser's appetitive and consummatory orientations that monomorphous expressions of happy smiles did not.

Study 4

Study 4 replicated and extended Study 3 with photographs that provided additional (and more

ecologically valid) emotional information via body language from the waist up.

Method

Participants

Participants again were compensated 25¢ for the approximate 3-min survey conducted as previously reported in Study 3 ($N = 146$; 65 female, 81 male; mean age = 32.86 years, range = 18–74, $SD = 9.91$; self-reported as 80% White, 6% Black, 5% Hispanic/Latino, 9% Asian, and <1% other).

Materials and procedure

The only difference in materials or procedure from Study 3 to Study 4 was the use of different photographs, that is, photographs now included head and upper body of tennis athletes. Participants reported their impressions of the tennis player's emotions, appetitive ($\alpha = 0.93$, 3 items) and consummatory ($\alpha = 0.91$, 3 items) orientations.

Results

In all conditions participants reported that the tennis players were experiencing “strong” to “overwhelming” happiness (anger-expression, $M = 4.23$, $SE = 0.13$); sadness-expression, $M = 4.22$, $SE = 0.13$; smile-expression, $M = 4.54$, $SE = 0.13$), and levels of sadness or anger in the “not at all” range (all means 1.11 to 1.47).

Main analyses

Study 4 closely replicated what had been found in Study 3. There was again, as hypothesised a significant interaction between condition and motivational orientations, $F(2, 143) = 25.62$, $p < .001$, partial eta squared = 0.10, observed power = 0.981. Participants in the anger-expression condition ($M = 3.67$, $SE = 0.18$) inferred higher appetitive orientations than those in the sadness-expression ($M = 2.45$, $SE = 0.17$, $p < .001$), and smile-expression ($M = 3.21$, $SE = 0.18$, $p < .001$) conditions. When considering consummatory orientations the patterns reversed. Those in the sadness-expression condition ($M = 2.92$, $SE = 0.15$) inferred higher consummatory orientations than those in the anger-expression condition ($M = 1.47$, $SE = 0.15$, $p < .001$) and smile-expression condition ($M = 1.87$, $SE = 0.15$, $p < .001$). Again appetitive and consummatory means for the smile-expression condition fell in

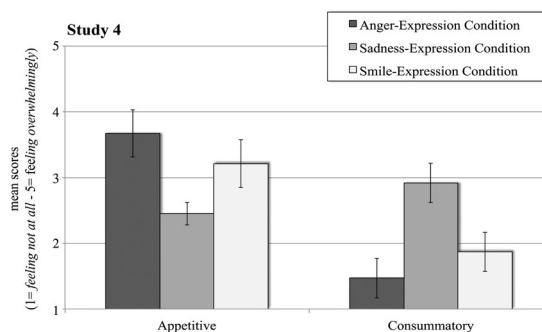


Figure 5. In Study 4 participants in anger-expression condition inferred the athlete to have higher appetitive orientations, than participants in the sadness-expression condition. In contrast, participants in sadness-expression condition inferred the athlete to have higher consummatory orientations than participants in anger-expression and smile-expression conditions. Error bars indicate ± 2 standard errors.

between the two manipulated conditions. Please see [Figure 5](#).

Discussion of Study 4

All measures in Study 4 closely replicated Study 3, generalising our findings to more naturalistic stimuli (i.e. not faces alone). Participants inferred that the expressers were experiencing strong positive emotions, imbuing those emotions with appetitive orientations when expressed with anger-expressions, and imbuing with consummatory orientation when expressed with sadness-expressions. The effects held in this larger bodily context, suggested that in day-to-day situations, these motivational orientations are readily communicated.

Study 5

In Study 5 we hypothesised that the mental representations of emotional experiences expressed through dimorphous displays also would be enriched with appetitive and consummatory orientations. That is, if dimorphous expressions are a kind of natural, habitual, and ubiquitous human emotional response, then people should possess a coherent and accessible mental representation about what is signified by a dimorphous display such as expressions of joy through tears, or joy through anger. Study 5 stripped down all information available to participants, and reduced it to only a brief verbal description of dimorphous or monomorphous expressions and relied upon

participants' own mental representations of what it signifies to learn verbally of happiness expressed through yelling, crying, or smiles.

We predicted that when told an athlete won an important competition and expressed his or her emotions with "could not help but to yell yes" participants would infer that the expresser was happy and in an appetitive state, with feelings of "wanting to go". In contrast, we predicted that when told an athlete won and expressed his or her emotions with "could not help but to cry", that the participants would infer the expresser was happy and in a consummatory state, with feelings of wanting to pause. And when told that the athlete won and "could not help but to smile" we predicted that participants' inferences would again fall in between the two dimorphous conditions.

Method

Participants

Participants were recruited and compensated as previously reported ($N = 147$; 62 female, 85 male; mean age = 32.10 years, range = 18–74, $SD = 10.39$; self-reported as 78% White, 4% Black, 3% Hispanic/Latino, 14% Asian, and 1% other).

Materials and procedure

Stimuli. Participants were assigned randomly to read one of three vignettes. No photographs were shown to these participants. In the smile condition participants read:

A famous professional tennis player, Rafael Nadal is an important figure in the tennis world. He is known as a strong player, a good sport, and a fair competitor. Nadal won the Australian Open, an important win for him after a long fought battle. The fans went wild when he won the final set. When he won, he could not help but to smile.

In the yell-yes condition the final words of the paragraph were yell yes. In the cry condition the final word was cry. In the trials that featured a woman, the name of the tennis player was changed to Victoria Azarenka and pronouns were changed from masculine to feminine.

Measures. Below the paragraphs were identical measures as described in Studies 3 and 4. Participants reported their impressions of the tennis player's emotional experience, appetitive ($\alpha = 0.88$, 3 items) and consummatory ($\alpha = 0.89$, 3 items) orientations.

Results

Participants again overwhelmingly inferred that the tennis player was experiencing happiness rather than sadness or anger (all means between 1.04 to 1.29), and in all conditions participants inferred that the tennis player was equally happy (yell-yes, $M = 4.58$, $SE = 0.10$; cry, $M = 4.66$; smile, $M = 4.61$, $SE = 0.09$). Study 5 closely replicated what had been found in Studies 3 and 4, with a significant interaction between condition and motivational orientations, $F(2, 144) = 6.44$, $p = .002$, partial eta squared = 0.08, observed power = 0.899. In the yell-yes condition ($M = 3.90$, $SE = 0.17$), participants inferred appetitive states to be higher than in the cry condition ($M = 3.21$, $SE = 0.16$). As the interaction would suggest, the pattern of results was different when considering consummatory states. In the cry condition ($M = 2.33$, $SE = 0.15$) consummatory states were inferred to be higher than in the yell-yes condition ($M = 1.64$, $SE = 0.16$). The means for appetitive ($M = 3.29$, $SE = 0.17$) and consummatory ($M = 2.08$, $SE = 0.15$) orientations in the smile condition again fell in between the two dimorphous expression conditions, but not consistently significantly different from both.

Discussion of Study 5

Study 5 similarly replicated what Studies 3 and 4, and illustrated that people did have mental representations of happiness expressed dimorphously and those representations included nuances of motivational orientations.

Study 6

In Study 6 we hypothesised that participants who read about a tennis player who reported "feeling like he just wanted to 'GO!' And that he had 'feelings of wanting to accelerate, and get moving!'" would infer that the person would express happiness through displays of anger rather than through displays of sadness. We hypothesised that participants who read about a tennis player who reported "'feeling like he just wanted to pause for a moment' And that he had 'feelings of wanting to stop, and be still'" would infer that the person would express happiness through displays of sadness rather than through displays of anger.

Method

Participants

Participants were again recruited and compensated as previously described ($N = 148$; 56 female, 92 male; mean age = 32.16 years, range = 19–68, $SD = 9.57$; self-reported as 74% White, 5% Black, 7% Hispanic/Latino, 12% Asian, and 2% other).

Materials

Participants were assigned randomly to one of two conditions: appetitive description or consummatory description. Participants in the appetitive condition read,

Below are two photographs of professional tennis player, Rafael Nadal, taken right at moments of important wins after long fought battles on the court. (Yes, these are real photographs taken after wins – taken at different times of course.) ... Nadal describes how he felt at this moment as “feeling like he just wanted to “GO!” And that he had “feelings of wanting to accelerate, and get moving!” Which one of the two photographs below, do you feel was taken at this moment in time?

In the consummatory condition, the underlined portion read, “feeling like he just wanted to pause for a moment” And that he had “feelings of wanting to stop, and be still”. In trials that featured the female model, the names were changed to Victoria Azarenka, and the pronouns were changed to indicate a woman. Below this paragraph were two headshots depicting aggressive or sad expressions, side-by-side. Participants made their selection by clicking on one of the two photographs, and then reported on the model’s emotional experience.

Participants then read the prompt, “If you had seen the photograph that you chose with an article about Nadal’s win, what would be your impression of the tennis player’s experience? To what extent do you feel the tennis player was feeling:” and answered questions about the model’s feelings (i.e. angry, sad, and happy).

Results

Participants in both the appetitive and consummatory conditions inferred that the tennis player was feeling strong happiness, appetitive $M = 3.77$, $SE = 0.15$ and consummatory, $M = 3.54$, $SE = 0.15$, $p = .265$. Participants in the appetitive condition ($M = 2.03$, $SE = 0.13$) inferred more anger than those in the consummatory condition ($M = 1.50$, $SE = 0.11$), and participants in the consummatory condition (M

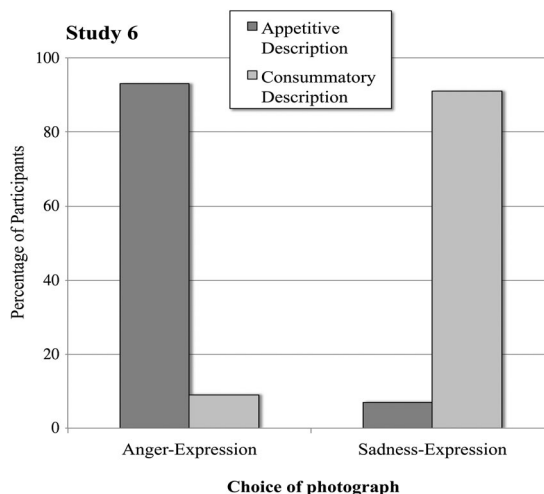


Figure 6. In Study 6, when participants were provided with an appetitive description they generally inferred that the expression that corresponded with such feelings was anger. In contrast, when participants were provided with a consummatory description, they generally inferred that the corresponding expression was one of sadness.

= 2.15, $SE = 0.15$) inferred more sadness than those in the appetitive condition ($M = 1.36$, $SE = 0.10$). However the means and confidence intervals straddled “not at all” to “mildly” responses.

Central to this investigation, there was a robust effect of condition on choice of photograph, $\chi^2 = 103.33$, $p < .001$. An overwhelming 93% of participants (68 of 73) in the appetitive condition chose the photograph in which the model displayed aggression, and an overwhelming 91% of participants (67 of 74) in the consummatory condition chose the photograph in which the model displayed sadness. Please see Figure 6.

Discussion of Study 6

As hypothesised, when participants were given the description of appetitive or consummatory states, in a forced choice paradigm, they overwhelmingly assumed that the appetitive description corresponded with happiness displayed through anger-expressions, and consummatory descriptions corresponded with happiness displayed through sadness-expressions.

Study 7

In Study 6 participants’ choices between sadness-expressions and anger-expressions were confounded

by the fact that choosing one meant not choosing the other. Therefore in Study 7, we replicated Study 6 with the addition of a third option of a smiling-face stimulus.

Method

Participants

Participants at a Southern-American state college were recruited through an introductory marketing class with an announcement of “a study about emotions” and were compensated with course credit ($N = 254$; 107 female, 146 male – one did not report gender; mean age = 20.41 years, $SD = 2.24$; self-reported as 85% White, 6% Black, 4% Hispanic/Latino, 2% Asian, and 3% other).

Materials

The materials were identical with respect to the reported experiment in Study 6 with the exception that an additional photograph featuring a smile-expression was provided as a third option from which to choose. Photographs again, were randomly counterbalanced and the gender of the model was randomly presented an equal number of times between conditions.

Results

Participants in both conditions inferred that the tennis player was feeling strong happiness (appetitive, $M = 4.04$, $SE = 0.10$; consummatory, $M = 3.99$, $SE = 0.10$). Participants in the appetitive condition inferred more anger ($M = 2.32$, $SE = 0.04$) than those in the consummatory condition ($M = 1.30$, $SE = 0.10$), and participants in the consummatory condition ($M = 1.82$, $SE = 0.08$) inferred more sadness than those in the appetitive condition ($M = 1.29$, $SE = 0.08$). However again the means and confidence intervals straddled “not at all” to “mildly” responses.

Central to this investigation there was a robust effect of condition on choice of photograph, $\chi^2 = 166.35$, $df = 2$, $p < .001$. An overwhelming 89% of participants (115 of 129) in the appetitive condition chose the photograph in which the model displayed aggression, which was significantly higher than the number in the appetitive condition who chose the smiling ($n = 10$; pairwise comparison $\chi^2 = 88.20$, $df = 1$, $p < .001$) or sadness-expressions ($n = 4$; pairwise comparison $\chi^2 = 103.54$, $df = 1$, $p < .001$). A majority, 58% of participants (72 of 125) in the consummatory condition

chose the photograph in which the model displayed sadness. This was significantly higher than the number of participants in the consummatory condition who chose the smiling ($n = 42$; pairwise comparison $\chi^2 = 7.90$, $df = 1$, $p = .005$) or anger-expressions ($n = 11$; pairwise comparison $\chi^2 = 44.83$, $df = 1$, $p < .001$).

Discussion of Study 7

Study 7 replicated Study 6 providing participants an option to choose an anger-expression, sadness-expression, or smiling-expression. Appetitive descriptions were most strongly associated with anger-expressions, and consummatory descriptions were most strongly associated with sadness-expressions. Participants likewise chose dimorphous expressions over monomorphous expressions of emotion within this context that would be presumed to bring about highly intense positive emotions. This provides support for the idea that dimorphous expressions may be normative displays when experiencing highly intense emotions.

Without detracting from our central theses of this paper, the variance in emotion perception across these studies should be addressed. Even though happiness was clearly the predominant emotion that the majority of participants associated the positive contexts that we provided, at least a few participants were associating at least some level of negative emotion within these positive contexts. However, this was not the rule across the seven studies. Low levels of negative emotions were interpreted in cases when the photographed headshots were used as stimuli (Studies 3, 6, and 7), but did not occur with photographs of upper bodies (Study 4), when participants were told a narrative about dimorphous expressions (Study 5), or when the same headshot photographs were used to prompt individuals' own experiences of emotion (Studies 1 and 2).

Here we offer three possible explanations for these differences. First, Aviezer et al. (2012) found that body language was important to the interpretation of what we consider dimorphous expressions. Possibly the use of headshots under certain circumstances, for some people, changes their interpretation of the emotion.

Second, in Studies 6 and 7, participants themselves chose the emotional expressions based upon (a) a positive winning context, and (b) the motivational orientation that they had been provided. After their choice, however, a few participants inferred low

levels of negative emotions that corresponded to the facial display that they themselves chose, that is, some who chose the anger-expression inferred the athlete was experiencing some anger, and some who chose the sadness-expression inferred that athlete was experiencing some sadness. Perhaps such evaluations were a *post hoc* assessment associated with the normative interpretation of those angry or sad expressions. This suggests that participants who did so might have disconnected their associations of the expressions from the original context.

Third, Aragón and Clark (2017b) suggested that individual differences in the dimorphous expression of emotion may be associated with individual differences in the interpretation of dimorphous expressions. Aragón reasoned that without having had the experience, these expressions might not be understood as intuitively. More research is required to understand fully the minority of participants, who, when provided with a positive context still interpret at least some negative emotion in dimorphous expressions.

Study 8

All studies reported thus far in this manuscript relied upon exemplars of anger and sadness taken in the context of victory and loss in a tennis match. Potentially, then, all effects derived thus far could be somehow specific to the world of tennis, or were the results of latent contextual cues within the photographs or the narrative of emotional expressions that was provided for them. We addressed these concerns in Study 8 by testing two additional domains, and by providing participants with previously validated exemplars of anger and sadness. Further, the exemplars of expression in Study 8 were visually separated from any contextual cues that might contribute to their interpretation.

Specifically in a 3×2 design, we had participants consider another's reactions to one of three contexts presented in a photograph: (1) a beautiful tropical beach scene, (2) a victory at Wimbledon, and (3) a basket of golden retriever puppies. Each contextual photograph was paired with a verbal description of a person's (1) appetitive or (2) consummatory response to such a context. Participants were then asked which of two facial expressions (one validated to be angry and one validated to be sad) would "best represent the feeling ... in that moment". Our predictions were that participants given the appetitive

description would infer anger-expressions, and participants given the consummatory description would infer sadness-expressions, regardless of the context within which the emotional experience arose (beach, win, or puppies).

In a pilot study we first confirmed our naturalistic observations of disparate dimorphous displays in response to awesome beauty or "cuteness". (Details of the pilot study are available from the first author.) Participants ($N = 287$, online) were asked to consider being faced with an idyllic tropical beach, a win at Wimbledon, or a basket of golden retriever puppies. We then suggested that they either might feel appetitive or consummatory orientations. Participants then were encouraged to freely disagree or agree (1–6 scale) that they themselves would display: anger-expressions, sadness-expressions, and smile-expressions.

The pilot study revealed that when we suggested to participants that they might feel appetitive orientations in the context of a tropical beach scene, 35% of participants reported that they would display aggression (i.e. grit your teeth, clench your hand(s) into fists), in the context of winning Wimbledon, 80% reported that they would display aggression, and when faced with a basket full of golden retriever puppies 43% reported that they would display aggression. When participants were assigned randomly to the condition where they might feel consummatory orientations in the beach setting, 71% reported that they would display sadness-expressions (i.e. tear up and cry), at Wimbledon, 44% reported that they would display sadness-expressions (i.e. break down and cry), and with a basket of puppies, 73% reported that they would display sadness-expressions (i.e. make a pronounced pouty, sad face). With this evidence of personal accounts of disparate dimorphous expressions in these two additional domains, we proceeded with Study 8, where the links between motivational orientations, and the expressions of emotion could be established across different domains.

Method

Participants

Participants were similarly recruited and compensated as previously described ($N = 569$; 272 female, 297 male; mean age = 34.32 years, range = 18–73, $SD = 11.35$; self-reported as 75% White, 7% Black, 8% Hispanic/Latino, 9% Asian, and 1% other).

Materials

Participants first read “Imagine this ...” and just below that instruction was a photograph of a beautiful tropic beach, the Wimbledon arena with fans at a distance in the stands taken from the perspective of being on the court, or of 10 golden retriever puppies sitting together in a large basket. Just below the photograph participants read,

A (vacationer, tennis player, dog lover) couldn't believe how (beautiful this island was, he just won Wimbledon, how cute these puppies were)! When he looked (out at that blue water, out at the crowd, at the puppies), he said that he “had a feeling inside like I just wanted to go”. The (vacationer, tennis player, dog lover) said he “had a desire to accelerate and get moving”. Being there (on that beach, in that winning moment, with those puppies), he was so overwhelmed with feelings he could not help but to say “aaahhh”. Please try to imagine how that (vacationer, tennis player, dog lover) was feeling. Click on the one photograph you feel would best represent the feeling he had in that moment”.

In the consummatory condition, the underlined portion was changed to “had a feeling inside like I just wanted to pause for a moment” and “had a desire to stop and be still”. When female actors were described pronouns were changed to the feminine.

On the next screen, participants were then presented with validated representations of emotional expressions with the Karolinska Directed Emotional Faces stimuli set (Lundqvist, Flykt, & Ohman, 1998). One female model (BF07ANHR angry pose, BF07SAHR sad pose) and one male model (BM31ANHR angry pose, BM31SAHR sad pose) were selected. Photographs were randomly counterbalanced, and gender of the model was randomly presented an equal number of times between conditions.

Results

Participants in all six conditions considered the person described to be predominantly experiencing happiness (all means between 3.55 and 4.16). All means and confidence intervals for inferences of anger and sadness fell within the “not at all” range of responses (all means between 1.19 and 1.77).

Primary to this investigation, there was a robust effect of motivation orientation on choice of expression, binary logistic regression, $\chi^2 = 34.40$, $p < .001$, $df = 1$, and this did not differ by context (interaction of beach and motivation orientation, $p = .54$; interaction of tennis by motivation orientation, p

$= .68$; interaction of puppies by orientation, $p = .49$). Participants in the appetitive description conditions were three times more likely than those in the consummatory description condition to pick the anger-expression than the sad expression, $b = 1.103$, $SE = 0.19$, $Wald = 32.45$, $p < .001$, likelihood ratio = 3.01. There were also main effects of context. Those in the Wimbledon context were more likely to pick the anger-expression than those in the beach or puppies conditions, $b = 1.16$, $SE = 0.20$, $Wald = 22.54$, $p < .001$, and those in the puppies context less likely to pick the anger-expression than those in the beach or Wimbledon contexts, $b = -1.22$, $SE = 0.23$, $Wald = 27.61$, $p < .001$.

Discussion of Study 8

The results of Study 8 generalised the findings of the previous seven studies beyond the specific domain of tennis, regarding both the expression and the perception of dimorphous emotions across several life domains, including the participants' own past emotional experiences. The results also indicated that context may modulate perceptions of appetitive and consummatory states, that is, some contexts may be seen as being more appetitive in nature, and some more consummatory in nature.

General discussion

Dimorphous expressions appear to represent specific emotional-motivational states. This series of investigations provided the first support for the idea that happiness expressed through aggressive displays, and anger expressed through aggressive displays represent experiences that are appetitive in nature, and that happiness expressed through sad displays and sadness expressed through sad displays, represent experiences that are consummatory in nature. This suggests that the production of emotional expressions might be more tightly linked with these motivational states than with the positivity or negativity of the emotion that is being experienced, as positivity or negativity of emotion did not differentiate emotion expression. These early experiments that demonstrated links between expression and motivational orientations might begin to explain why during dimorphous expressions the normatively congruent and incongruent displays pair in the way that they do. Moreover, these experiments might also inform the production of expression more broadly, in that motivational

orientations may be a common factor in emotion expressions that appear across positive and negative contexts.

The production of dimorphous expressions appears to be a conventional expression of emotion. In Study 1, participants who had been assigned randomly to consider positive contexts reported that they would and that they did recall, making expressions of anger and sadness on par in frequency with those participants who had been assigned randomly to consider negative contexts. In Study 7, when participants were asked to choose a facial expression to accompany a positive context with a brief description of appetitive and consummatory orientations, participants chose dimorphous expressions with greater frequency than choosing a monomorphous smile-expression. Emotional expressions have long been thought to represent at a minimum the general valence of an emotion in a categorised, congruent way. Yet at these high intensities, emotional expressions do not fit neatly into basic emotion categories (Ekman & Friesen, 1971). At high intensities of emotion, dimorphous expressions may be more the norm than the exception.

At this time, dimorphous expressions are defined at the broad level of the coupling of one normatively positive, and one normatively negative expressive display. It could be that expressions of anger or sadness in positive contexts are expressions of discrete emotional states yet to be identified. However, dimorphous displays of positive emotions that include anger- or sadness-expressions occur in very different types of contexts that one would think to bring about different “flavors” of positive emotions. For instance, feelings of triumph might be expected upon winning a long fought battle, intense feelings of tenderness might be expected when in the presence of cute little beings, and feelings of awe might be expected when in a beautiful nature scene. Yet, in the expression of all three “flavors” of positive emotions dimorphous expressions with displays of anger and sadness appear to occur. This suggests a more general property to these dimorphous expressions. This work would suggest that the general property is the appetitive or consummatory motivational orientations. Clearly, more work is to be done to gain a better understanding of these processes.

Important to the hypothesis that dimorphous expressions may serve a function to communicate these motivational appetitive and consummatory states, participants nuanced their perceptions of the happy-expressions with appetitive and consummatory

states when they were dimorphously expressed over-and-above what was inferred from simple smiles. Thus, a potential reason why these expressions might exist at all, is that they serve a communicative function (Fridlund & Russell, 2006) to help in coordination with one another in our social world.

Notes

1. Please see Supplementary Materials for detailed method and results for all studies reported in this paper.
2. Underline is used in this manuscript to highlight changes that were made between conditions. Underline did not appear in any of the stimuli.
3. Some variables were collected for convergent validation, including intensity of emotion, arousal as conceptualised in regard to happiness (excited, and calm), dominance dimensions (powerful, and fragile), and drive for and savouring of rewards. These variables did provide convergent validity, but are not the central focus of this investigation, and are reported in detail in the Supplementary Materials section.

Disclosure statement

No potential conflict of interest was reported by the authors.

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