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ORIGINAL PAPER

The Duchenne Smile and Persuasion

Sarah D. Gunnery · Judith A. Hall

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Abstract We investigated persuasiveness as a social outcome of the ability to produce a deliberate Duchenne smile in a role-play task and of a participant's use of a Duchenne smile while persuading someone in a live interaction. Participants were tasked with persuading an experimenter to drink a pleasant and unpleasant tasting juice as well as not drink a pleasant and unpleasant juice while being videotaped. Participants' deliberate Duchenne smiling ability was measured by asking participants to smile while acting out "genuine happiness" and also to mask imagined negative affect with a smile. Smiles in the deliberate Duchenne smiling task and the persuasion task were coded for presence of the Duchenne marker, and naïve viewers of the persuasion task made ratings of how pleasant they thought the juice was. Results showed further evidence that a sizeable minority of people can deliberately produce a Duchenne smile and showed that those with this ability are more persuasive. When persuading to drink the pleasant tasting juice, the correlation between the ability to produce a deliberate Duchenne smile and persuasion was partially due to the use of the Duchenne smile while persuading, but this was not the case with the unpleasant tasting juice. When persuading to drink the unpleasant juice, participants who could deliberately put on the Duchenne smile were more persuasive but their persuasiveness was not the result of using a Duchenne smile during the persuasion task.

Keywords Duchenne smile · Persuasion · Expressive control · Individual differences

S. D. Gunnery (✉)
Department of Occupational Therapy, Tufts University, 26 Winthrop St., Medford, MA 02155, USA
e-mail: sarah.gunnery@tufts.edu

J. A. Hall
Department of Psychology, Northeastern University, Boston, MA 02115, USA
e-mail: j.hall@neu.edu

Introduction

The Duchenne smile is an expression that includes activation of the zygomatic major muscle which pulls the lip corners up into a smile, and activation of the orbicularis oculi muscles which raise the cheeks to create crow's feet around the eyes (Ekman et al. 2002). Until recently, the Duchenne smile has mostly been studied as, and assumed to be, a genuine readout of positive emotion. Although numerous studies have reported findings of deliberate Duchenne smiling (e.g., Ekman and Davidson 1993; Smith et al. 1996), these findings have until very recently been reported as methodological details with no real theoretical importance. While there are previous lines of research that have investigated how nonverbal behavior and facial expressions are in general used as deliberate social signals (Elfenbein et al. 2007; Fridlund 1997), only recently has the production of the deliberate Duchenne smile become a theoretically relevant topic. As more and more studies begin to provide evidence that the Duchenne smile can be produced deliberately (Gunnery et al. 2013; Krumhuber and Manstead 2009) and that people do deliberately produce Duchenne smiles in simulated social situations (Gunnery et al. 2013), more research is needed to investigate the perceptions and social outcomes of the expression. The aim of the current study is to investigate how the ability to put on a deliberate Duchenne smile, as well as the use of the Duchenne smile in an actual social interaction, are related to a person's ability to persuade others.

Perceptions of Duchenne Smiles

Much research has investigated how people perceive Duchenne smiles. Overall, previous findings show that Duchenne smiles are perceived more positively than smiles that lack the Duchenne marker, or cheek raiser activation (Frank and Ekman 1993; Thibault et al. 2009).

The list of positive characteristics that people attribute to those displaying Duchenne smiles is quite lengthy. Mehu et al. (2007) found that people showing Duchenne smiles were rated as more generous and extroverted as compared to people showing non-Duchenne smiles. Woodzicka (2008) found that in a job interview context, people who produce Duchenne smiles are rated as more hireable and competent than people who display non-Duchenne smiles. Bernstein et al. (2010) found that people prefer others who are displaying genuine (or Duchenne) smile as opposed to non-Duchenne smiles after they have faced social exclusion.

The above studies are only a small sample from a larger tradition of published work, but they demonstrate both that Duchenne smiles are perceived more positively than non-Duchenne smiles, and that the vast majority of work looking at how Duchenne smiles are perceived and how people might benefit from producing the expression has been completed under the assumption that the Duchenne smile is a spontaneous expression of enjoyment that can only be produced when someone is feeling genuinely happy.

The Deliberate Duchenne Smile

Throughout the previous literature on the Duchenne smile, there are many instances in which studies have found that a majority of participants can deliberately produce Duchenne smiles. This has been found in unselected populations (e.g., Ekman and Davidson 1993), people with limited facial expressivity due to Parkinson's disease (e.g., Smith et al. 1996), and trained actors (e.g., Carroll and Russell 1997), but despite these findings, the Duchenne smile was still most frequently discussed as an unfakeable or spontaneous

expression throughout the literature. Recent research has begun to break out of this tradition by explicitly showing that people can willfully activate the necessary muscles to deliberately produce a Duchenne smile (Gosselin et al. 2010), and that they choose to deliberately use the expression even when not given explicit instructions (Gunnery et al. 2013; Krumhuber and Manstead 2009). These recent papers provide a clear understanding that people can deliberately produce Duchenne smiles, as well as some initial data on how these deliberate Duchenne smiles are perceived. Krumhuber and Manstead (2009) found that participants rated spontaneous Duchenne smiles as more genuine than deliberate Duchenne smiles, and both Krumhuber and Manstead (2009) and Gunnery et al. (2013) found that deliberate Duchenne smiles are perceived more positively than non-Duchenne smiles.

When discussing the ability to deliberately put on a Duchenne smile that is perceived as genuine, the words fake, manipulative, and deceptive often slip into the conversation whether it is colloquial or empirical in nature (Ekman and Friesen 1982; Ekman et al. 1988). It is hard to talk about a deliberate facial expression that can be used to cover up negative feelings outside the context of deception and manipulation, but the expression does not have to be used deceptively or manipulatively.

There are many social situations where one may choose to put on a deliberate Duchenne smile for prosocial or benign communicative purposes. People may cover up disappointment or disliking with a Duchenne smile to avoid hurting another person's feelings or because although they are not feeling genuinely happy, they want to communicate that they appreciated the favor another person did for them. Deliberately putting on a Duchenne smile does not have to be done for personal gain, but can also be used to smooth over a social interaction or accurately communicate information. For example, a person may want to communicate he or she is happy to have run into a friend even though he or she is really feeling anxious because of being late for an appointment, or may wish to express sincere gratitude for a gift received in a previous week in spite of not feeling especially happy at the moment. In such a case the person can recreate the expression that would have gone with the original spontaneous happy feeling. Thus, the expression and its message may be authentic and sincere, but not coincide with the predominant affective state being experienced in the moment. In other instances, the deliberate Duchenne smile may also be synchronous with happy affect, as when a person really likes the gift and wants to make sure the gift-giver knows it.

The Present Study

While deception is not necessarily the motivating force behind the use of the deliberate Duchenne smile, it is likely that people who are able to deliberately put on a Duchenne smile are better able to cover up felt negative affect. Deception in the form of covering up underlying emotions lends itself well to the study of the relationship between ability to deliberately produce a Duchenne smile and the social outcomes of this ability. To test this hypothesis, the present study utilized a taste persuasion paradigm where participants had to express to an experimenter that they enjoyed the taste of a pleasant and unpleasant tasting juice, and that they disliked the taste of the same juices, in order to persuade the experimenter either to try or not try the juice (Feldman et al. 1999). In using this task, we were able to look at the relationship between the choice to produce a Duchenne smile and persuasiveness in two contexts that were congruent with underlying affect (persuading a person to drink the pleasant tasting juice, or not to drink the unpleasant tasting juice) and

two contexts that were incongruent with underlying affect (persuading a person to drink the unpleasant juice, or persuading a person not to drink the pleasant tasting juice). Appropriateness of the use of the Duchenne smile is crossed with affective congruence in these four tasks, as it is appropriate and seemingly helpful (at least from the persuader's perspective) to produce a Duchenne smile when persuading to drink the juice, and inappropriate and unhelpful when persuading not to drink the juice.

Ekman et al. (1988) reported that when people are lying about feeling happy they show more non-Duchenne than Duchenne smiles, as the non-Duchenne smile is easy to do on purpose and the Duchenne smile is supposedly near impossible. However, the abundance of evidence showing that it is quite possible to deliberately put on a Duchenne smile (e.g., Gunnery et al. 2013; Krumhuber and Manstead 2009) leads to the hypothesis that people who are able to deliberately produce a Duchenne smile will use the expression when trying to mask felt negative affect in order to appear positive and will therefore be more successful when persuading to drink the unpleasant juice.

It is not possible to infer with confidence whether Duchenne smiles produced during spontaneous tasks, such as a persuasion paradigm, are deliberate or involuntary. Mood can be measured and controlled for so it is possible to say the person produced a Duchenne smile without feeling happy, but it is also plausible that a person could feel happy but still deliberately produce a Duchenne smile. In order to measure participants' ability to put on a deliberate Duchenne smile, we employed a role-play paradigm where participants act out different emotion-specific scenarios in rapid succession, modified from Gunnery et al. (2013). This way, participants' ability to deliberately put on a Duchenne smile can be correlated with their use of the Duchenne smile during the persuasion task as well as with how persuasive they were during the task, although it cannot be inferred whether the Duchenne smiles produced during the persuasion task are deliberate or spontaneous.

We hypothesized that those who were able to produce the deliberate Duchenne smile during the role-play task would be more persuasive overall, indicating that people who can produce deliberate Duchenne smiles are more nonverbally and socially skilled. We also hypothesized that participants who were able to deliberately produce a Duchenne smile would be more likely to use the Duchenne smile when persuading the experimenter to drink the different juices, and more likely to not smile when persuading the experimenter not to drink the juices as we hypothesized they would have more expressive control in general.

Method

Participants

Eighty (70 % female) Northeastern University undergraduates participated in the first phase of this study. Fifty-five participants participated for partial credit in their introductory psychology course. Twenty-three participants were recruited from a previous unpublished study on deliberate Duchenne smiling and were paid $15.00 for their participation. Two participants were excluded due to problems with videotapes leaving a total of 78 (69 % female).

In the second phase of the study, 200 Northeastern undergraduate students participated as naïve viewers for partial credit in their introductory psychology course.

Tasks

Taste Persuasion Paradigm

In the taste persuasion paradigm modeled after Feldman et al. (1999), participants were videotaped while they persuaded a male experimenter who was blind to the participant's instructions to (1) taste a pleasant tasting juice, (2) taste an unpleasant tasting juice, (3) not taste a pleasant tasting juice, or (4) not taste an unpleasant tasting juice. This meant that participants persuaded the experimenter two times in a way that was congruent with the taste of the juice and two times in a way that was opposite to how the juice tasted. This allowed for the measurement of whether participants employed a Duchenne smile to mask feelings of disgust or disliking. When participants persuaded the experimenter to drink the juice, they were instructed to sip the juice and then look up at the camera, smile, and say, "This is really good. You should try it." When the participants were to persuade the experimenter not to drink the juice, they were instructed to sip the juice and then look up at the camera with a disgusted face and say, "This is really gross. You should not try it."

The pleasant tasting juice was sweetened cranberry juice and the unpleasant juice was 100 % unsweetened cranberry juice. The juice was given to participants in small black plastic cups so that neither the experimenter with them nor naïve raters who watched the videotape later could identify the different juices by color. The persuasion condition was randomized by a third party who placed each drink sample and persuasion instructions in numbered brown paper bags. The experimenter remained blind to the fact that all participants tasted two different juices while persuading to drink the juices and while persuading not to drink the juices. The participants also were never explicitly told of the experimental design, but likely deduced what it was following the completion of all four persuasion tasks.

Duchenne Role-Play Task

Following the completion of the taste perception task, participants were instructed to pose a facial expression for each of seven scripted role-plays (adapted from Gunnery et al. 2013). On four of these, participants were instructed to smile; of these, two described role-plays where the smiles would be "fake" happiness smiles (masked disappointment and masked disliking of another person), and two described role-plays where the smiles would be, in real life, "genuine" happiness smiles (happy greeting a friend and happy over a good grade). The remaining three (control) role-plays did not describe or request smiling and were intended, by their nature, to be irrelevant to the smiling theme (genuine sympathy, fake sympathy, genuine worry). The four smiling role-plays were interspersed with the three control role-plays so that no two smiling role-plays were adjacent. All participants posed the role-plays in the same order.

All expressions were directed at a video camera that was in plain sight. For each role-play the context and the participant's intended emotional state were described to the participant, and the participant was given an appropriate sentence to say. An example of a "genuine" role-play is "You are feeling happy. You are together with your best group of friends. One of them suggests going out to a great new club. You smile and say, 'That's a great idea!'" In all of the smiling role-plays, participants were explicitly told to smile.

Procedure

Upon entering the lab the experimenter gave the participant a brief overview of the experiment, which included an outline of all videotape procedures. The experimenter then explained that the participant would be given four juices to taste and that the participant would have to persuade the experimenter either to taste or not taste the juice. The experimenter asked the participant if they had any allergies to fruit juice before giving them the juice to taste. Before tasting the juices the participant had no knowledge of what type of fruit juice they would be trying and that half of the drink samples would taste pleasant and half would taste unpleasant.

After tasting each juice and making their persuasive statement, participants rated how pleasant they found the juice, how likely they were to try the juice again, and how happy, content, pleasant, and cheerful they felt while persuading. All ratings were made on a scale of 1 (*not at all*) to 9 (*extremely*). The four emotion ratings were averaged into one happiness score.

After each taste, the experimenter also rated how pleasant he thought the participant found the juice to be and how likely he would be to try the juice given the opportunity, but never actually tried any of the juices. The experimenter and participant both made their ratings at opposite sides of a round table. In doing so, neither could see the other's ratings.

Smile Coding

The first smile in each participant's four taste trials and in each smiling role-play was coded for the presence and intensity of AU 6 (orbicularis oculi) and AU 12 (zygomatic major) using the FACS guidelines that include additional techniques for coding the presence of AU 6 when AU 12 is of a high intensity because it is possible for very intense activations of AU 12 to raise the cheeks causing crow's feet around the eyes independent of AU 6 activation. The additional techniques require the presence of a slight droop in the eyelid, slight bunching underneath the eye, or a slight drop in the outer eye brow (Ekman et al. 2002). A second certified FACS coder coded 25 % of the persuasion task stimuli resulting in good reliability with a kappa of .70 for coding AU 6 and .74 for coding AU 12. Reliability was also good for AU 6 intensity ($\alpha = .63$) and AU 12 intensity ($\alpha = .87$).

Stimulus Tape Construction

Participants' four taste tasks were edited into five videotapes. Each videotape included 16 participants' four taste trials. The tapes were edited so that each of the 16 participants' first trials were shown before showing the second, third, and fourth trials. Pauses were edited in between each clip to give naïve viewers adequate time to make their ratings. The taste trials remained randomized in the same order they were videotaped in. Each clip was edited to begin when the taste cup was removed from the lips so that it was no longer occluding the facial expression and to end at the completion of the persuasion statement.

Naïve Viewer Ratings

Approximately 40 naïve viewers viewed each stimulus tape in groups ranging from 1 to 5 viewers. Naïve viewers made ratings of how likely they would be to try the juice and how pleasant they thought the juice would be. Both of these ratings were made on 9-point Likert scales from 1 (*not at all*) to 9 (*extremely*).

Results

Taste Manipulation Check

To test whether participants actually found the pleasant juice pleasant and the unpleasant juice unpleasant we compared participants' mean pleasantness ratings that were made on a 9-point Likert scale ranging from 1 (*not at all*) to 9 (*extremely*). The pleasant juice was rated as more pleasant ($M = 6.96$) than the unpleasant juice ($M = 2.10$), $t(77) = 26.83$, $p < .001$.

Percentage of Smiles that Were Duchenne

The mean percentages of smiles that were Duchenne in each task are displayed in Table 1. Replicating Gunnery et al. (2013), a sizeable minority of participants produced a Duchenne smile when role-playing both "genuine" (M percentage = 44.59) and "fake" (i.e., masked negative affect) (M percentage = 39.29) happiness scenarios. Also replicating Gunnery et al. (2013), these two mean percentages did not differ from each other, $t(68) = 1.13$, $p = .26$. This provides evidence that Duchenne smiling in the "genuine happiness" role-plays was not the spontaneous result of positive affect.[1]

Table 1 shows that a sizeable minority of participants who smiled produced a Duchenne smile when persuading the experimenter to drink both the pleasant and unpleasant juices, and these two percentages did not differ, $t(42) = 1.16$, $p = .25$. This indicates that participants did not produce a Duchenne smile less when the drink was unpleasant than when it was pleasant although they did rate the pleasant juice as much more pleasant than the unpleasant juice.

Participants' self-reported happiness ratings were not correlated with their Duchenne smiling behavior for the pleasant juice, $r(51) = .07$, $p = .58$, nor the unpleasant juice, $r(49) = -.08$, $p = .57$. Since participants reported more happiness when persuading to drink the pleasant juice ($M = 5.75$) than when persuading to drink the unpleasant juice ($M = 3.30$), $t(76) = 10.75$, $p < .001$, it appears that participants responded to the persuasion instructions and used deliberate Duchenne smiles rather than responding with the facial expression that appropriately matched their underlying emotional state.

The Duchenne Smile and Intensity

Even when using the coding techniques for coding the Duchenne marker in intense smiles, production of the Duchenne marker is correlated with the intensity of the smile. Duchenne smiles are more intense than non-Duchenne smiles (see Table 2 for intensity correlations). It is not surprising that Duchenne smiles would be more intense because both characteristics of the smile are used to communicate more happiness. We will be reporting the results in terms of the relationship between persuasion and the Duchenne smile with the underlying knowledge that the Duchenne marker and smile intensity covary.

[1] Twenty-three of the participants in the present study had also completed the deliberate Duchenne role-play task in a previous unpublished study conducted in 2011. Their performance on the task the year earlier was correlated with the performance in the present study. Duchenne smiling across all smiling role-plays was correlated from Time 1 to Time 2, $r(20) = .62$, $p < .01$. However, this consistency was apparent only for Duchenne smiling in the "genuine happiness" role-plays, $r(19) = .61$, $p < .01$. Duchenne smiling in the "fake happiness" role-plays was not correlated between the 2 years, $r(19) = .25$, $p = .25$.

Table 1 Mean percentage of smiles that were Duchenne across all smiling tasks

Task	Mean %	*SD*	*N*
"Genuine happiness" role-play	44.59	42.66	74
"Fake happiness" role-play	39.29	41.61	70
Persuading to drink the pleasant juice	33.33	47.58	54
Persuading to drink the unpleasant juice	29.41	46.02	51
Persuading not to drink the pleasant juice	6.67	25.82	15
Persuading not to drink the unpleasant juice	33.33	48.31	21

N is the number of participants out of the total *N* of 78 who smiled in each task. Participants who did not smile (i.e., ignored the task instructions in the persuade yes conditions) are not included

Table 2 Correlations between occurrence of Duchenne smile and smile intensity ratings in each task

Task	Correlation
"Genuine happiness" role-play	.60**
"Fake happiness" role-play	.47**
Persuading to drink the pleasant juice	.63**
Persuading to drink the unpleasant juice	.51**

** $p < .01$

Persuasion Results

Naïve viewers' ratings of how likely they would be to try the juice and how pleasant they thought the juice would be were highly correlated for all four taste conditions (ranging from $r = .83$ to .94) so a composite pleasantness score was created. Due to greater reliability in the larger sample of raters, we used the naïve viewers' pleasantness composite as the dependent variable in all the persuasion analyses (naïve viewers' ratings were correlated with the experimenters' ratings, ranging from $r = .19$ to .38 across the four taste trials).

A 2 (juice type: pleasant or unpleasant) × 2 (persuasion direction: to taste or not to taste) repeated measures analysis of variance (ANOVA) revealed a main effect for juice type, $F(1, 77) = 5.18$, $p < .05$, indicating that the naïve viewers rated the pleasant tasting juice as likely to be more pleasant independent of whether they were viewing the participant persuade the experimenter to drink the juice or not to drink the juice. There was also a main effect for persuasion direction, $F(1,77) = 397.29$, $p < .001$, indicating that naïve viewers rated both juices as much more likely to be pleasant when they were being told to drink them than being told not to drink them. The interaction between juice type and persuasion direction was not significant, $F(1,77) = .68$, $p = .41$, meaning that naïve viewers' pleasantness ratings were influenced equally by the taste instructions for both kinds of juice. See Table 3 for means.

Relationship Between the Duchenne Smile and Persuasion

Duchenne Smiling in the Taste Task and Persuasion

When persuading the experimenter to drink the pleasant juice, producing a Duchenne smile rather than a non-Duchenne smile was related to higher naïve viewers' ratings of pleasantness,

Table 3 Naïve viewers' mean pleasantness ratings

Juice type	Persuasion direction		
	Taste	Don't taste	Mean
Pleasant	5.51 (1.02)	2.50 (.79)	4.01 (.56)
Unpleasant	5.27 (1.18)	2.38 (.83)	3.83 (.70)
Mean	5.39 (.96)	2.44 (.69)	

Standard deviations are in parentheses

$r(52) = .33$, $p < .05$. Producing a Duchenne smile when persuading someone to drink the unpleasant juice was not correlated with naïve viewers' pleasantness ratings, $r(49) = -.05$, $p = .72$. These findings together indicate that when participants were persuading in the truthful condition, use of the Duchenne smile was helpful, whereas when they were persuading in a counterfactual direction the Duchenne smile neither helped nor hurt. This leads one to believe that participants were engaging in some other type of nonverbal behavior, whether it was something in the face or voice, which led them to be more persuasive when they were persuading to drink the unpleasant juice because the verbal content was kept constant.

The Deliberate Duchenne Smile and Persuasion

An investigation of the relationship between ability to produce a deliberate Duchenne smile and pleasantness ratings revealed that naïve viewers rated both juices as more pleasant when being persuaded by participants who produced a higher percentage of Duchenne smiles in the "genuine happiness" role-plays; see Table 4 for correlations. These finding suggest that participants who showed a greater ability to produce deliberate Duchenne smiles were more persuasive when persuading in the positive direction.

A mixed model ANOVA was conducted with juice type (pleasant or unpleasant) and persuasion direction (persuade to taste it or persuade not to taste it) as within-subjects factors and Duchenne smiling in the "genuine happiness" role-plays (which was operationally defined as producing a Duchenne smile in either or both "genuine happiness" role-plays, versus not producing a Duchenne smiled in either role-play) as a between-subjects factor. In addition to showing that that naïve viewers rated the juice as more pleasant when participants were persuading the experimenter to drink it rather than not drink it, the ANOVA revealed a significant interaction between persuasion direction and Duchenne smiling in the "genuine happiness" role-plays, $F(1,72) = 5.95$, $p < .05$. The means displayed in Fig. 1 showed that participants who produced at least one Duchenne smile when role-playing "genuine happiness" received higher pleasantness ratings when persuading to drink the juice and lower pleasantness ratings when persuading not to drink the juice relative to participants who did not produce any Duchenne smiles in the "genuine happiness" role-plays. This difference in pleasantness ratings indicates that participants were more persuasive when persuading in both directions (to drink and not to drink) when they exhibited the ability to deliberately produce a Duchenne smile. Table 4, first column, reveals this pattern in correlational form (positive correlations with deliberate Duchenne smiling in the persuade to drink conditions and negative correlations with deliberate Duchenne smiling in the persuade not to drink conditions).

When the same ANOVA was run for deliberate Duchenne smiling in the "fake happiness" role-plays, there was no interaction between persuasion direction and deliberate

Table 4 Correlations between pleasantness ratings in the four taste conditions and deliberate Duchenne smiling in the role-plays

Persuasion condition	"GH" role-plays	"FH" role-plays
Persuading to drink the pleasant juice	.23*	.05
Persuading not to drink the pleasant juice	−.12	.05
Persuading to drink the unpleasant juice	.24*	.03
Persuading not to drink the unpleasant juice	−.19	−.16

GH genuine happiness, *FH* fake happiness

* $p < .05$

Duchenne smiling, $F(1, 68) = 1.34$, $p = .25$, and Table 4, second column, shows this as well.

The Deliberate Duchenne Smile and Duchenne Smiling in the Taste Task

It was predicted that the relationship between the ability to produce a deliberate Duchenne smile and persuasiveness would be reduced when controlling for the use of the Duchenne smile while persuading. This prediction was supported in the pleasant juice condition. When controlling for whether or not those participants who smiled used a Duchenne smile when persuading someone to drink the pleasant juice, there was no longer a marginally significant correlation between demonstrating an ability to produce a deliberate Duchenne smile and the pleasantness ratings, $r_{partial} = .16$, $p = .27$ (compared to the correlation of $r(51) = .25$, $p = .07$,[2] before partialing). However, controlling for whether participants produced a Duchenne smile when persuading in the correlation between ability to produce a deliberate Duchenne smile in the "genuine happiness" role-plays and pleasantness ratings indicates that this prediction was not supported when participants were tasting the unpleasant juice because the correlation remained marginally significant, $r_{partial} = .27$, $p = .06$ as compared to $r(49) = .25$, $p = .07$, when Duchenne smiling while persuading to drink the unpleasant juice is not controlled for. This shows that when persuading to drink the unpleasant juice, participants with the ability to produce a deliberate Duchenne smile were more persuasive independent of whether they used a Duchenne smile while persuading. This difference between smiling behavior in the pleasant and unpleasant juice conditions indicates that participants who can deliberately produce a Duchenne smile are more persuasive, but the data only showed a trend towards participants using the Duchenne smile to persuade when persuading to drink the pleasant juice.

Individual Differences in the Use of the Duchenne Smile

Consistency Across Smiling Tasks

The correlations between the percentages of smiles that were Duchenne in all the smiling tasks where Duchenne smiling would be the appropriate response are displayed in Table 5. Replicating Gunnery et al.'s (2013) findings, participants who Duchenne smiled when

[2] These correlations differ from the correlations between persuasion and deliberate Duchenne smiling in the previous section, because they only include people who smiled while persuading. Thus the *N* dropped in both cases.

role-playing "genuine happiness" were more likely to produce a Duchenne smile when role-playing "fake happiness." Also, participants who displayed a Duchenne smile while persuading someone to drink the pleasant juice were also more likely to display a Duchenne smile while persuading someone to drink the unpleasant juice, and were more likely to produce a deliberate Duchenne smile when in the "genuine happiness" and marginally when in the "fake happiness" role-plays. Producing a Duchenne smile when persuading someone to drink the unpleasant juice was not correlated with the ability to produce a Duchenne smile in either smiling role-play.

Gender Differences

There were no gender differences in the percentages of Duchenne smiles produced in any of the smiling tasks, nor in how persuasive naïve viewers rated participants to be.

Discussion

These findings produce further evidence that the Duchenne smile can be produced deliberately. In addition to this, the correlations among smiling tasks show that the ability to produce a deliberate Duchenne smile is an individual difference. Furthermore, these

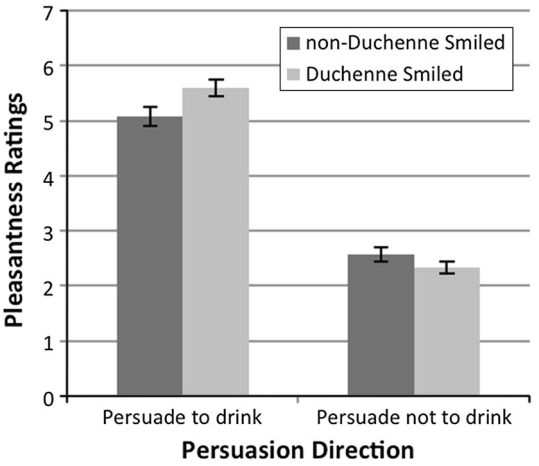

Fig. 1 Mean pleasantness ratings by persuasion direction and whether or not the participant produced a Duchenne smile when role-playing "genuine happiness."

Table 5 Correlations between Duchenne smiling across the deliberate Duchenne smiling tasks and the persuasion tasks

Tasks	1.	2.	3.	4.
1. "Genuine happiness" role-play	–	.37**	.34*	.21
2. "Fake happiness" role-play		–	.24^{+}	.18
3. Persuading to drink the pleasant juice			–	.40**
4. Persuading to drink the unpleasant juice				–

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$

findings show that people who have the ability to produce a Duchenne smile deliberately are more persuasive, but that they may use the deliberate Duchenne smile only when they are persuading another person to do something that is not contrary to the factual nature of the object of persuasion—in this case, persuading someone to drink a juice that did not taste good. This suggests that people who knew how to produce the deliberate Duchenne smile did not necessarily choose to use it for a deceptive purpose. Although this is contrary to the original hypothesis that they would indeed use it under such a circumstance, it is interesting nonetheless. There is, in fact, no logical reason to assume that being able to make this expression deliberately requires a person to use it in any given situation. Instead, there may be individual differences in willingness to use the expression for manipulative purposes.

These data suggest that the relationship between the ability to produce a deliberate Duchenne smile and persuasion is dependent on the context in which the person is persuading. When persuading to drink the pleasant juice, the correlation between deliberate Duchenne smiling ability in the "genuine happiness" role-plays and persuasiveness was reduced when controlling for participants' use of the Duchenne smiling while persuading, suggesting that those persuasive smiles were deliberate. People who had the ability to deliberately produce a Duchenne smile appeared to use it in an appropriate situation to be more persuasive. In contrast, when tasting the unpleasant juice participants who had displayed the ability to produce a deliberate Duchenne smile when role-playing "genuine happiness" were more persuasive but it was definitely not their use of the Duchenne smile in that situation that made them more persuasive. This points to a different characteristic shared by those who can deliberately Duchenne smile and those who can persuade someone to do something unpleasant by acting as though it is pleasant.

As the current study was testing the relationship between the Duchenne smile and persuasion, this was the only nonverbal cue measured. The correlation between ability and produce a deliberate Duchenne smile and persuasiveness in the unpleasant juice condition indicates that people with the ability to produce a Duchenne smile deliberately may have more nonverbal skill. This nonverbal skill could be in the form of encoding certain vocal cues or facial muscle movements other than the Duchenne smile that made them more persuasive in that condition. Future research should measure these other nonverbal cues to test what makes people with the ability to produce a Duchenne smile more persuasive when persuading someone to try something unpleasant.

Evidence from self-reported happiness ratings and patterns in Duchenne smiling behavior indicate that many of the Duchenne smiles produced during the persuasion task were in fact deliberate. Finding that an equal number of Duchenne smiles were produced when persuading the pleasant and unpleasant juices supports this claim. The claim is further supported by the lack of correlation between participants' happiness ratings and Duchenne smiling during the persuasion task. If these were spontaneous Duchenne smiles, then there should be higher levels of self-reported happiness among those who produced Duchenne smiles.

Smile intensity has proven to be an interesting correlate of Duchenne smile production and perception. This study, along with others (e.g., Krumhuber and Manstead 2009), shows that smile intensity and presence of the Duchenne marker naturally covary. Studies that are entirely focused on how the Duchenne smile affects person perception are able to control for intensity by matching Duchenne and non-Duchenne smiles on intensity, and some such studies have done so (e.g., Peace et al. 2006). However, when the researcher's interest is in the perception of smiles that are produced naturally, the connection between these two characteristics cannot be separated. By acknowledging the presence of these strong

correlations, researchers can speak about the Duchenne smile and its nature in a more informed and complete way.

The correlations between ability to produce a deliberate Duchenne smile across tasks provide further evidence for the ability to produce a Duchenne smile as an individual difference. Some people have the ability and choose to use it and others do not. The current study has implications for everyday life within this context. This is the first study to show that people who can produce a Duchenne smile are more persuasive in a separate social context, and indicates that people with this ability receive some benefits in their social interactions.

The theory that smiles serve the purpose of sending signals rather than being the evolutionarily derived readout of felt emotion is not new to the study of nonverbal behavior (i.e., Fernández-Dols and Ruiz-Belda 1995), but the Duchenne smile is rarely talked about within this framework. The Duchenne smile is still used in scientific papers and more visibly in popular media (i.e., BBC's smile quiz; http://www.bbc.co.uk/science/humanbody/mind/surveys/smiles/) to describe an expression that is the readout of felt happiness or as real. It is described as authentic while non-Duchenne smiles are inauthentic. The current study was conducted within the relatively new perspective on the Duchenne smile as deliberate to investigate if those people who have the ability to produce a deliberate Duchenne smile receive positive social outcomes. This is the first study to move past showing that some people can produce a Duchenne smile deliberately, and to look at how people with the ability behave in a more social situation. As the field's understanding of the Duchenne smile shifts from viewing it as an indicator that a person is feeling happy to an indicator that a person wants to express happiness, more studies that investigate correlates and behavioral outcomes of the ability to produce a Duchenne smile are needed.

Future research will further explore the connection between the deliberate Duchenne smile, use of the Duchenne smile in social situations, and how these two different behaviors can predict positive social outcomes. This will be done by first testing for this relationship in different persuasion contexts that have both positive and negative affective aspects. This will allow us to test the effects of affective context on the relationship between the deliberate Duchenne smile and persuasion. Secondly, new social outcome domains need to be explored in order to investigate how production of the deliberate Duchenne smile affects other aspects of social life, such as dating and health outcomes.

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