

Social transmission of face preferences among humans

Benedict C. Jones^{1,*}, Lisa M. DeBruine¹, Anthony C. Little²,
Robert P. Burriss³ and David R. Feinberg⁴

¹*Face Research Laboratory, School of Psychology, William Guild Building, University of Aberdeen, Aberdeen AB24 2UB, UK*

²*School of Psychology, University of Stirling, Stirling FK9 4LA, UK*

³*School of Biological Sciences, University of Liverpool, Liverpool L69 7ZB, UK*

⁴*Department of Psychology, Harvard University, Cambridge, MA 02138, USA*

Previous studies demonstrating mate choice copying effects among females in non-human species have led many researchers to propose that social transmission of mate preferences may influence sexual selection for male traits. Although it has been suggested that social transmission may also influence mate preferences in humans, there is little empirical support for such effects. Here, we show that observing other women with smiling (i.e. positive) expressions looking at male faces increased women's preferences for those men to a greater extent than did observing women with neutral (i.e. relatively negative) expressions looking at male faces. By contrast, the reverse was true for male participants (i.e. observing women with neutral expressions looking at male faces increased male participant's preferences for those men to a greater extent than did observing women smiling at male faces). This latter finding suggests that within-sex competition promotes negative attitudes among men towards other men who are the target of positive social interest from women. Our findings demonstrate that social transmission of face preferences influences judgments of men's attractiveness, potentially demonstrating a mechanism for social transmission of mate preferences.

Keywords: facial attractiveness; public information; social learning; mate preferences

1. INTRODUCTION

Mate choice copying has been observed among females in a number of different non-human species (for reviews see Dugatkin 2000; Brown & Fawcett 2005; Galef & Laland 2005), including guppies (e.g. Dugatkin 1992; Dugatkin & Godin 1993; Godin *et al.* 2005), Japanese quail (e.g. Galef & White 1998; White & Galef 2000; Ophir & Galef 2003) and zebra finches (Swaddle *et al.* 2005). Studies have demonstrated that females who observe another female that was paired with one of two males are subsequently more likely to prefer the male that was paired with the female over the unpaired male (Dugatkin 1992; Dugatkin & Godin 1993; Galef & White 1998; White & Galef 2000; Ophir & Galef 2003; Swaddle *et al.* 2005). Furthermore, experiments have shown that such effects cannot be explained by changes to males' behaviour after pairing with females or females preferring locations where more conspecifics had been present (see White (2004) and Brown & Fawcett (2005) for discussion). Indeed, copying effects in female mate choice are not limited to preferences for the specific males that were seen during the observation phase, but also generalize to preferences for novel males that are physically similar to the paired male (White & Galef 2000; Godin *et al.* 2005; Swaddle *et al.* 2005). While orthodox models of sexual selection have emphasized genetic influences on female mate preferences (e.g. Andersson 1994), mate choice

copying effects such as those outlined above have led many researchers to propose that social transmission of mate preferences may also contribute to sexual selection for male traits (Kirkpatrick & Dugatkin 1994; Laland 1994; Brown & Fawcett 2005; Galef & Laland 2005).

Mate choice copying in females could be adaptive when there is a cost (e.g. time and energy) in evaluating the quality of potential mates or when discrimination between the quality of potential mates is difficult (Wade & Pruett-Jones 1990). Although researchers have suggested that social transmission of mate preferences may occur among women (e.g. Dugatkin 2000; Uller & Johansson 2003; Brown & Fawcett 2005), few empirical studies have investigated this issue (Uller & Johansson 2003). Uller & Johansson (2003) tested for evidence of mate choice copying among women by assessing the effect of the presence or absence of a wedding ring on women's attractiveness ratings of men, but found no evidence for mate choice copying among women (i.e. the presence of wedding rings on men did not increase women's attractiveness ratings of the men). Thus, Uller & Johansson (2003) suggested that social transmission of mate preferences among women might be more complicated than the mate choice copying effects observed in other species. Indeed, relatively subtle cues to the *valence* of women's attitudes to certain men may influence other women's preferences for those men.

People are adept at integrating information from cues to the direction of others' social interest (e.g. head or gaze direction) and cues to their emotional state (e.g. facial

* Author for correspondence (ben.jones@abdn.ac.uk).

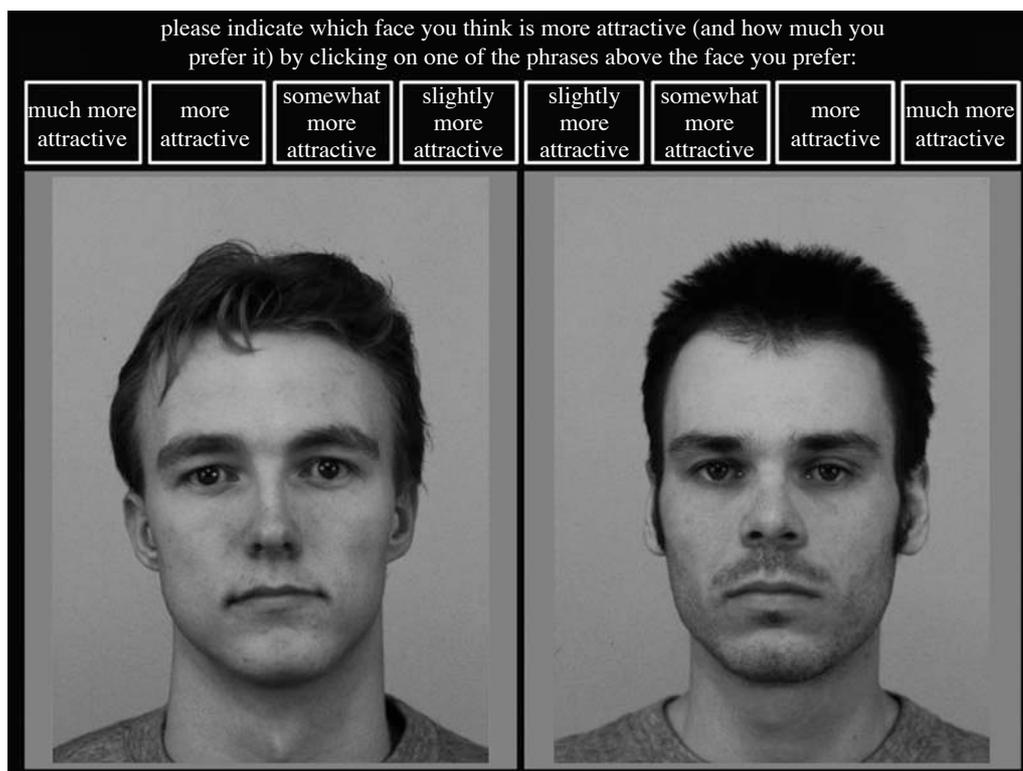


Figure 1. In the pre- and post-tests, participants chose the more attractive from pairs of male faces roughly matched on general attractiveness by clicking on one of the labelled buttons above the faces to generate a preference score for the target face ranging from 0 (non-target face judged as ‘much more attractive’) to 7 (target face judged as ‘much more attractive’).

expressions) in order to discern their intentions and attitudes (Adams & Kleck 2003; Jones *et al.* 2006). Such cues may therefore contribute to social transmission of preferences among humans. In light of this, here, we tested if women’s preferences for men’s faces are influenced by facial cues of other women’s attitudes to those men. Specifically, we compared the effect of observing other women smiling at male faces (indicating positive interest in those men) to the effect of observing other women with a relatively negative expression looking at male faces (indicating less interest in those men).

In our experiment, participants first viewed eight pairs of male faces and indicated which face in each pair they preferred and how strongly they preferred it. Following this, participants viewed a slideshow where they saw the same pairs of male faces, but in which a woman was shown looking at one of the men in each pair with either a happy expression (i.e. smiling) or a relatively negative (i.e. neutral) expression. After the slide show, participants repeated the initial face preference test. If women are influenced by cues of other women’s attitudes to the men, we predicted that female observers would increase their preference for men who they had seen being smiled at by women more than they would increase their preference for men who they had seen being looked at by women with a neutral expression.

In addition to testing for evidence of social transmission of face preferences among women, we also tested whether observing women’s attitudes to male faces influenced men’s perceptions of these male faces. Since within-sex competition may promote negative attitudes towards men who are the target of positive interest from women (Buss 1994), we hypothesized that findings for male participants would be the reverse of those we expected for female

participants (i.e. male observers would decrease their preference for men who they had seen being smiled at by women more than they would decrease their preference for men who they had seen being looked at by women with a neutral expression). Previous studies have also used attractiveness judgments of own-sex faces to test hypotheses concerning within-sex competition effects on social behaviour (Fisher 2004).

2. MATERIAL AND METHODS

(a) Stimuli

Stimuli were full-colour face images of young, white European adults from the Karolinska directed emotional faces (KDEF) image set (Lundqvist & Litton 1998).

Thirty male faces with neutral expressions facing directly at the camera were rated by 40 female participants (mean age = 22.94 years, s.d. = 6.33; Cronbach’s $\alpha = 0.95$) for attractiveness on a scale from 1 (very unattractive) to 7 (very attractive). Using these attractiveness ratings, eight pairs of male faces were chosen from this set with each pair having roughly equal average attractiveness. This was done to minimize the possibility of ceiling and floor effects on initial face preferences masking any effects of social transmission of attitudes to faces (i.e. very strong preferences are unlikely to be significantly altered by public information; Nordell & Valone 1998).

Eight female faces with both neutral and smiling expressions were photographed in left profile. Female faces in right profile were made by mirror-reversing the left profile images.

(b) Procedure

The procedure consisted of three parts: (i) a preliminary test of attraction to male faces (pre-observation phase test), (ii) an



Figure 2. In the observation phase, participants saw one of the four fully counterbalanced conditions. Four male pairs were arbitrarily designated as group 1 (represented by the top row for each condition) and the other four were designated as group 2 (bottom row). In conditions *a* and *c*, women looked at the faces that were arbitrarily designated face A and in conditions *b* and *d*, women looked at the other faces (face B). In conditions *a* and *b*, women looked at group 1 with a neutral expression and at group 2 with a smiling expression. In conditions *c* and *d*, women looked at group 1 with a smiling expression and at group 2 with a neutral expression.

observation phase, and (iii) a repeat of the test of attraction to male faces (post-observation phase test). Participants were 28 women (mean age = 24.30 years, s.d. = 6.15) and 28 men (mean age = 26.04 years, s.d. = 6.63).

In the pre-observation test, participants were shown eight pairs of male faces, roughly matched for attractiveness, and were asked to indicate which face was more attractive on an 8-point scale (figure 1). The face in each pair that was to be looked at by the female face during the observation phase was designated as the target face. Thus, each of the eight decisions were coded as follows: 7, target face judged as 'much more attractive'; 6, target face judged as 'more attractive'; 5, target face judged as 'somewhat attractive'; 4, target face judged as 'slightly more attractive'; 3, non-target (paired) face judged as 'slightly more attractive'; 2, non-target face judged as 'somewhat more attractive'; 1, non-target face judged as 'more attractive' and 0, non-target face judged as 'much more attractive'. The order and side of presentation were fully randomized.

In the observation phase, participants viewed these same pairs of male faces, this time flanking a female face. Each of

the eight pairs of male faces was associated with a different female face. Female faces were shown in profile, looking at one of the male faces in each pair. One half of the female faces were shown with a neutral expression, the other half of the female faces were shown with a smiling expression. To control for any possible effects due to the characteristics of the individual male or female faces, participants were allocated to one of the four conditions that fully counterbalanced which male faces were being looked at with a neutral versus smiling expression and which face in each pair was being looked at (figure 2). To control for possible effects of side biases in visual attention (Uttl & Pilkenton-Taylor 2001) and/or expression processing (Burt & Perrett 1997), each group of three faces was shown twice, once with the female face looking to the left and once with the female face looking to the right and the side of presentation of the male faces reversed. Groupings were shown for 2 s each, totalling 32 s of observation.

Immediately after the observation phase of the study, participants completed a post-observation face preference test that was identical to the pre-observation test.

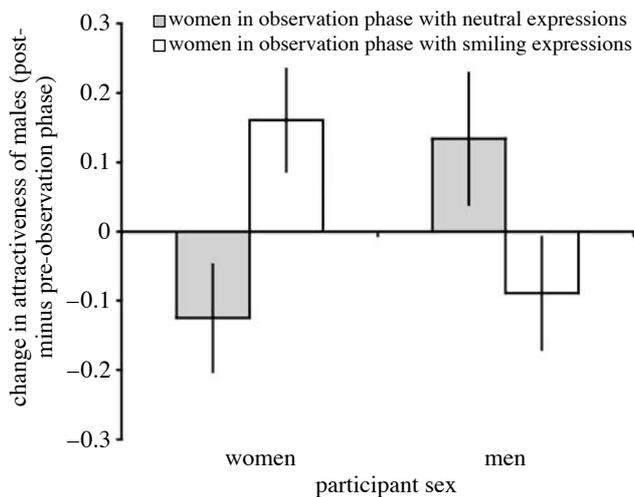


Figure 3. The significant interaction between sex of the participant and facial expression of the observed women. While observing other women smiling at male faces increased women's preferences for those male faces more than did observing other women with a neutral expression looking at male faces, the reverse was true for male participants. The Y-axis shows the change in attractiveness of the target male faces from pre- to post-observation phase test. Bars show means and SEMs.

3. RESULTS

Responses were analysed using a mixed design ANOVA with the dependent variable *change in mean strength of preference for looked-at faces* (i.e. post-observation minus pre-observation), within-subjects factor *facial expression of observed women* (happy, neutral) and between-subjects factors *looked-at face* (face A, face B), *smiled-at group* (group 1, group 2) and *sex of participant* (male, female). Consistent with our hypotheses, this analysis revealed a significant interaction between sex of participant and facial expression of observed women ($F(1,48) = 8.70, p = 0.005$; figure 3) and no other significant effects (all $F < 2.14$, all $p > 0.15$).

For female participants, a paired samples *t*-test comparing the change in mean strength of preference for target faces in the happy and neutral conditions showed that the increase in preference for faces that were smiled at by women during the observation phase was greater than that for faces that were looked at by women with neutral expressions ($t(27) = 2.44, p = 0.021$). By contrast, for male participants, the increase in preference for faces that were looked at by women with neutral expressions during the observation phase was greater than that for faces that were smiled at by women ($t(27) = -2.22, p = 0.035$).

4. DISCUSSION

Our findings demonstrate that facial cues to others' attitudes about faces influence viewers' preferences for those faces. For female participants, observing other women smiling at male faces increased the strength of their preferences for these male faces, while observing other women with a relatively negative expression looking at male faces tended to decrease the strength of their preferences for those male faces. These findings show that social transmission of preferences influences women's attractiveness judgments of men's faces. Importantly, our findings cannot be explained as a by-product of individual differences in attraction to different types of male faces (e.g. Penton-Voak *et al.* 1999;

Little *et al.* 2001, 2002; Jones *et al.* 2005) because we show a within-subjects change in women's face preferences following the observation phase of the experiment.

Consistent with our hypotheses, observing women either smiling at male faces or looking at male faces with a neutral expression affected men's judgments of the male faces differently from the way they affected women's judgments. For male participants, observing other women looking at a male face with a neutral expression increased the strength of their preferences for this same male face, while observing other women smiling at a male face decreased the strength of their preferences for this same male face. This effect is consistent with the proposal that within-sex competition promotes negative attitudes towards men who are the target of positive social interest from women (Buss 1994). While social transmission of face preferences affected female participants' attitudes to these men in a way that was congruent with the observed women's attitudes, it appears to have an opposite effect on male participants' attitudes to these men. Our findings for social transmission of face preferences are therefore difficult to explain simply in terms of attractiveness after-effects, since recent visual experience with a given face configuration increases the attractiveness of that face configuration irrespective of the sex of the perceiver (Little *et al.* 2005; Buckingham *et al.* 2006).

Uller & Johansson (2003) suggested that social transmission of mate preferences among women might be more sophisticated than the mate choice copying effects observed in non-human females. Our findings for female participants' attractiveness judgments of male faces are consistent with this proposal, as they demonstrate that the valence of other women's attitudes towards certain men influences female observers' preferences for these men. Nonetheless, in so far as attractiveness ratings of opposite-sex faces reflect mate preferences, our findings are also consistent with the suggestion that social transmission may influence women's mate preferences (Dugatkin 2000; Brown & Fawcett 2005). However, further research is required to compare the extent to which social transmission of face preferences influences women's preferences for potential mates and same-sex associates and also to investigate the extent to which social transmission of face preferences among same-sex groups influences person perception. Such research would offer insights into the extent to which the effects we observed reflect social transmission of mate preferences specifically or social transmission of positive regard more generally.

Although the valence of women's interest in target males was systematically manipulated in our experiment, empirical findings from previous studies have found that women demonstrate positive attitudes to men displaying cues that are associated with possible direct and indirect benefits (e.g. high health, high socioeconomic status, willingness to invest in offspring; Hume & Montgomerie 2001; Roberts *et al.* 2005; Roney *et al.* 2006). Furthermore, Hazlett & Hoehn-Saric (2000) found that women were more likely to spontaneously smile when viewing attractive male faces than when viewing unattractive male faces (as indicated by greater zygomatic electromyographic responses when viewing the attractive faces). Thus, social transmission of face preferences among women during social encounters may reinforce preferences for these attractive male traits.

REFERENCES

- Adams Jr, R. B. & Kleck, R. E. 2003 Perceived gaze direction and the processing of facial displays of emotion. *Psychol. Sci.* **14**, 644–647. (doi:10.1046/j.0956-7976.2003.psci.1479.x)
- Andersson, M. 1994 *Sexual selection*. Princeton, NJ: Princeton University Press.
- Brown, G. R. & Fawcett, T. W. 2005 Sexual selection: copycat mating in birds. *Curr. Biol.* **15**, 626–628. (doi:10.1016/j.cub.2005.08.005)
- Buckingham, G., DeBruine, L. M., Little, A. C., Welling, L. L. M., Conway, C. A., Tiddeman, B. P. & Jones, B. C. 2006 Visual adaptation to masculine and feminine faces influences generalized preferences and perceptions of trustworthiness. *Evol. Hum. Behav.* **27**, 381–389. (doi:10.1016/j.evolhumbehav.2006.03.001)
- Burt, D. M. & Perrett, D. I. 1997 Perceptual asymmetries in judgements of facial attractiveness, age, gender, speech and expression. *Neuropsychologia* **35**, 685–693. (doi:10.1016/S0028-3932(96)00111-X)
- Buss, D. M. 1994 *The evolution of desire*. New York, NY: Basic Books.
- Dugatkin, L. A. 1992 Sexual selection and imitation: females copy the mate choice of others. *Am. Nat.* **139**, 1384–1389. (doi:10.1086/285392)
- Dugatkin, L. A. 2000 *The imitation factor: evolution beyond the gene*. New York, NY: Free Press.
- Dugatkin, L. A. & Godin, J.-G. 1993 Female mate-choice copying in the guppy (*Poecilia reticulata*): age-dependent effects. *Behav. Ecol.* **4**, 289–292.
- Fisher, M. L. 2004 Female intrasexual competition decreases female facial attractiveness. *Proc. R. Soc. B* **271**, S283–S285. (doi:10.1098/rsbl.2004.0160)
- Galef Jr, B. G. & Laland, K. N. 2005 Social learning in animals: empirical studies and theoretical models. *BioScience* **55**, 489–499. (doi:10.1641/0006-3568(2005)055[0489:SLIAES]2.0.CO;2)
- Galef Jr, B. G. & White, D. J. 1998 Mate-choice copying in Japanese quail, *Coturnix coturnix japonica*. *Anim. Behav.* **55**, 545–552. (doi:10.1006/anbe.1997.0616)
- Godin, J. G. J., Herman, E. J. E. & Dugatkin, L. A. 2005 Social influences on female mate choice in the guppy, *Poecilia reticulata*: generalized and repeatable trait-copying behaviour. *Anim. Behav.* **69**, 999–1005. (doi:10.1016/j.anbehav.2004.07.016)
- Hazlett, R. L. & Hoehn-Saric, R. 2000 Effects of perceived physical attractiveness on females' facial displays and affect. *Evol. Hum. Behav.* **21**, 49–57. (doi:10.1016/S1090-5138(99)00036-7)
- Hume, D. & Montgomerie, R. 2001 Facial attractiveness signals different aspects of "quality" in women and men. *Evol. Hum. Behav.* **22**, 93–112. (doi:10.1016/S1090-5138(00)00065-9)
- Jones, B. C. et al. 2005 Menstrual cycle, pregnancy and oral contraceptive use alter attraction to apparent health in faces. *Proc. R. Soc. B* **272**, 347–354. (doi:10.1098/rspb.2004.2962)
- Jones, B. C., DeBruine, L. M., Little, A. C., Conway, C. & Feinberg, D. R. 2006 Integrating gaze direction and expression in preferences for attractive faces. *Psychol. Sci.* **17**, 588–591. (doi:10.1111/j.1467-9280.2006.01749.x)
- Kirkpatrick, M. & Dugatkin, L. A. 1994 Sexual selection and the evolutionary effects of copying mate choice. *Behav. Ecol. Sociobiol.* **34**, 443–449.
- Laland, K. N. 1994 Sexual selection with a culturally transmitted mating preference. *Theor. Popul. Biol.* **45**, 1–15. (doi:10.1006/tpbi.1994.1001)
- Little, A. C., Burt, D. M., Penton-Voak, I. S. & Perrett, D. I. 2001 Self-perceived attractiveness influences human preferences for sexual dimorphism and symmetry in male faces. *Proc. R. Soc. B* **268**, 39–44. (doi:10.1098/rspb.2000.1327)
- Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M. & Perrett, D. I. 2002 Partnership status and the temporal context of relationships influence human female preferences for sexual dimorphism in male face shape. *Proc. R. Soc. B* **269**, 1095–1100. (doi:10.1098/rspb.2002.1984)
- Little, A. C., DeBruine, L. M. & Jones, B. C. 2005 Sex-contingent face aftereffects suggest distinct neural populations code male and female faces. *Proc. R. Soc. B* **272**, 2283–2287. (doi:10.1098/rspb.2005.3220)
- Lundqvist, D. & Litton, J.-E. 1998 *The averaged Karolinska directed emotional faces—AKDEF*. AKDEF CDROM Stockholm, USA: Psychology section, Karolinska Institute.
- Nordell, S. E. & Valone, T. J. 1998 Mate choice copying as public information. *Ecol. Lett.* **1**, 74–76. (doi:10.1046/j.1461-0248.1998.00025.x)
- Ophir, A. G. & Galef Jr, B. G. 2003 Female Japanese quail associate with live males that they have seen mate on video. *Anim. Behav.* **65**, 369–375. (doi:10.1006/anbe.2003.2229)
- Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K. & Minamisawa, R. 1999 Menstrual cycle alters face preference. *Nature* **399**, 741–742. (doi:10.1038/21557)
- Roberts, S. C., Little, A. C., Gosling, L. M., Perrett, D. I., Carter, V. S., Jones, B. C., Penton-Voak, I. S. & Petrie, M. 2005 MHC-heterozygosity and human facial attractiveness. *Evol. Hum. Behav.* **26**, 213–226. (doi:10.1016/j.evolhumbehav.2004.09.002)
- Roney, J. R., Hanson, K. N., Durante, K. M. & Maestripieri, D. 2006 Reading men's faces: women's mate attractiveness judgments track men's testosterone and interest in infants. *Proc. R. Soc. B* **273**, 2169–2175. (doi:10.1098/rspb.2006.3569)
- Swaddle, J. P., Cathey, M. G., Correll, M. & Hodkinson, B. P. 2005 Socially transmitted mate preferences in a monogamous bird: a non-genetic mechanism of sexual selection. *Proc. R. Soc. B* **272**, 1053–1058. (doi:10.1098/rspb.2005.3054)
- Uller, T. & Johansson, L. C. 2003 Human mate choice and the wedding ring effect: are married men more attractive? *Hum. Nat.* **14**, 267–276.
- Uttl, B. & Pilkenton-Taylor, C. 2001 Letter cancellation performance across the adult life span. *Clin. Neuropsychol.* **15**, 521–530.
- Wade, M. J. & Pruett-Jones, S. G. 1990 Female copying increases the variance in male mating success. *Proc. Natl Acad. Sci. USA* **87**, 5749–5753. (doi:10.1073/pnas.87.15.5749)
- White, D. J. 2004 Influences of social learning on mate-choice decisions. *Learn. Behav.* **32**, 105–113.
- White, D. J. & Galef Jr, B. G. 2000 "Culture" in quail: social influences on mate choices of female *Coturnix japonica*. *Anim. Behav.* **59**, 975–979. (doi:10.1006/anbe.1999.1402)