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ontextualized emotion perception assessment elates to personal and social well-being

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BSTRACT

Emotion Recognition Accuracy (ERA) s vital for social functioning and so al relationships, yet empirical support for a positive link with well-being as been sparse. In three studies, we s ow that the ssessment of Contextualized Emotions (ACE) which distinguishes between accurately perceiv ng ntended emotions and bias due to perceiving additional, secondary emotions, onsistently predicted personal and social well-being. Across t teen world cultures, accuracy was associated with gher well-being and life satisfaction, and bias linked to loneliness. social nteraction study n Czech Republic found accuracy (bias) was positively (negatively) associated with social well-being. The effects of accuracy and bias on well-being were partially mediated by social nteraction quality n a third study. These findings further our understanding of ERA's social functions.

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The emotional expressions of others are a source of social n-formation, onveying ues to others' affective and mental states (Darwin, 1872/1965; Matsumoto et al., 2008). Therefore, Emotion Recognition Accuracy (ERA), the accurate assessment of others' emotion expressions, s rucial for t e regulation of relationships and for social functioning more generally (Adolphs, 2002; Fischer & Manstead, 2008). ERA an elp to streamline and synchronize nterpersonal ommunication as it underpins emotional nteractions among people (Feldman et al., 1991; Niedenthal & Brauer, 2012). One key assumption by proponents of the emotional ntelligence (EI) onstruct which ncorporates ERA (Salovey & Mayer, 1990), s that gher EI promotes more constructive and armonious elationships with others, and ence t an enable ncreased levels of well-being and appiness (Zeidner et al., 2012). As such, gher ERA skills are expected to predict gher well-being (Palese & Schmid Mast, 2020; Schmid Mast & Hall, 2018).

Yet, even though there s evidence for a link between well-being and both general emotional ompetencies (Lanciano & Gurci, 2015; Sánchez-Álvarez et al., 2016) and interpersonal sensitivity (Hall et al., 2009) – which both encompass ERA onceptually –- empirical evidence concerning a specific positive link between gher ERA and well-being s sparse. We argue that this is explained by the way that ERA has been assessed n much of this esearch. Specifically, existing esearch as assessed ERA based on ontextless facial information thereby endering what s essentially a social perception task nto a ognitive pattern matching task (Hess & Kafetsios, 2021; Kafetsios & Hess, 2022; 2023). We present evidence from three studies which nvolve d fferent ultural groups and d fferent ndicators of well-being. The findings suggest that nfusing ontext nto emotion perception renders ERA a key predictor of social and personal well-being and point to social nteraction quality as a mediator of this association.

1. The particularly thin evidence hat link ERA with personal and social well-being

Carton et al. (1999) was one of the first to provide some evidence for the elationship between ERA (using t e Diagnostic nalysis of Nonverbal Accuracy [DANVA] faces) and social well-being (reports of positive elations with others). Since t at study, owever, only very limited empirical evidence replicating that initial finding and extending it to social and personal well-being as emerged. In what follows, we briefly eview this evidence.

First, the ayer Salovey Caruso Emotional Intelligence Test-Faces (MSCEIT-Faces as part of t e EI abilities set) was found to be practi- ally unrelated with well-being elated ndices such as anxiety and positive well-being (Lanciano & Gurci, 2015). In the same vein, even though the MSCEIT-Faces performance test was associated with less anxious thoughts (Bastian et al., 2005) and lower dysfunctional umination (Lanciano et al., 2012), t was not significantly elated with subjective well-being (Bastian et al., 2005). In another study (van Beek & Dubas, 2008), naccuracy in decoding facial expressions of emotions n drawings by early adolescents was not associated with depressive symptoms. Instead, the attributions adolescents made of the expressions predicted depression levels. ore ecently, using the Geneva Emotion Recognition Test, a performance test where participants watch actors portraying 14 different emotions, Schlegel (2020) found no s gnificant associations with well-being, life satisfaction, or ealth ndicators a oss 17 different samples. This lack of evidence was further reinforced, by a more omprehensive study (Sommer & Schlegel, 2024) t at fa led to find relationships between scores on the Geneva Emotion Recognition Test and either personal o social well-being ndicators, ncluding daily measures of well-being, and a generic evaluation of peoples' daily social nteraction. However, n another study using the same ERA method (Schlegel et al., 2021) some evidence for an nverse elationship between ERA and negative (but not positive) affect emerged.

The absence of strong evidence for a relationship between ERA and personal and social well-being s puzzling given t e arguments for a onnection between general EI skills and social ompetence (Brackett et al., 2006; Lopes et al., 2004). Indeed, a *meta*-analysis that examined the elationship between EI and subjective well-being (SWB, Sánchez-Ívarez et al., 2016) found a positive elationship with performance-based ability EI nstruments (mainly the MSCEIT) and SWB.[1] nother *meta*-analysis has also eturned onsistent and meaningful elationships between the elated, but more general, notion of nterpersonal sensitivity, t e "accurate judgment o ecall of others' behavior or appearance" (p. 149, Hall et al., 2009) and social and personal well-being.

2. A Consideration of raditional ERA models

Hess and Kafetsios have argued (Hess & Kafetsios, 2021; Kafetsios & Hess, 2023) and shown evidence (Hess et al., 2016; Kafetsios & Hess, 2022) for the notion that t e inability to find meaningful elationships between ERA and various predicted outcomes (such as prosocial personality styles, elational quality, social well-being) can be traced ba k to the use of a limited model and method when assessing ERA. Existing ERA models and methods[2] adopt a cognitive pattern matching, approach that essentially changes a social perception task nto a cognitive task, by stripping out t e social ontext within which social perception takes place and ntroducing a d scrimination, nstead of ecognition, task (Hess & Kafetsios, 2021). When ERA models and methods nclude ontext, then socio-cognitive apabilities (perspective taking, mental attribution) are also engaged (North et al., 2010; Zaki and O sner, 2011). It s in those nstances that ERA derived from contextual models and methods can predict prosocial personality traits (Kafetsios & Hess, 2022), social nteraction quality (Hess et al., 2016), cultural o entations (Hess et al., 2016), and perspective taking (Antypa et al., 2024).

2.1. The present studies

For the present studies we utilized the ssessment of Contextualized Emotion (ACE) model – an ERA model and method t at onceptualizes Emotion Decoding uracy as a social perception task ather than a ognitive task (Hess & Kafetsios, 2022). T e CE model (Hess et al., 2016) nvolves social context when assessing emotion decoding accuracy. By embedding the expresser together with others, the CE ncludes the most generic social ontext (other people) n the emotion decoding process. CE d stinguishes between emotion decoding accuracy (the signal, the accurate perception of intended emotions, e.g., sadness for a sad expresser), and emotion decoding bias (noise, t e perception of other, secondary, emotions that may o may not be actually shown but are perceived, such as anger for a sad expresser).[3] In line with the Truth and B as model of social perception (West & Kenny, 2011; see also Funder, 1995; Zaki, 2013) CE accuracy and bias a e fundamentally separate processes, with bias being distinguishable from mere e or (see Hess & Kafetsios, 2021). By embedding ERA within a social ontext and allowing decoders to assess, simultaneously, accuracy and bias, the ssessment of Contextualized Emotion allows to tap participants'

[1] Sánchez-Álvarez et al. (2016) study also onsiders the elation between self-report mixed EI nstruments, and self-report ability EI nstruments and SWB. s in our study we focus only on ability EI (i.e., emotion perception) we do not onsider previous esearch using self-report measures (for trait EI relation with well-being, see also Austin, 2005).

[2] These nclude: T e Diagnostic nalysis of Non-verbal uracy scale (DANVA; Nowicki & Duke, 2001), the Geneva Emotional Competence Test (GECo; Schlegel & Mortillaro, 2019), Ekman Faces Test /Pictures of Facial ffect (Young et al., 2002), ultimodal Emotion Recognition Test (MERT; Bänziger et al., 2009) among others.

[3] In o der to properly assess the nfluence of social knowledge on Emotion Decoding uracy (EDA), t s nsufficient to merely evaluate secondary emotions. Secondary emotions are more likely to be perceived when observe s engage in perspective-taking to understand others, but this process s contingent on the availability of a social context during the perception process.

perspective taking capabilities. Indeed, supporting this idea, recent neuroimaging evidence suggests that an ACE-type emotion task activates brain regions involved in theory of mind, unlike tasks that simply require labelling an emotion expression without context (Antypa et al., 2024).

In everyday social exchanges – which by definition take place in the context of other people, interaction partners draw on their emotional knowledge and engage in perspective-taking to understand others' emotional states, relying on more than just facial muscle movements. In line with this notion, ACE accuracy and bias have distinct, measurable, and significant impacts on social interaction. In three event sampling (diary) studies conducted in Greece and in Germany, ACE accuracy and bias emerged as unique, meaningful predictors of social interaction quality (Hess et al., 2016). In a diary study (Kafetsios & Hess, 2019), ACE bias mediated the link between the Difficulty in Identifying Feelings dimension of alexithymia and social interaction outcomes leading the authors to argue that bias as measured in the ACE can tap the lack of attunement in dyadic social interactions observed in people with alexithymia (Foran and O'Leary, 2012). In contrast, and consistently, neither a standard emotion perception task, the Mayer, Salovey, and Caruso Emotional Intelligence Test (MSCEIT) faces part (Mayer et al., 2003), nor a traditional hit rates approach to measuring accuracy by associating one (correct) label to a given emotion expression, were found to have the same predictive power (Hess et al., 2016; Kafetsios & Hess, 2022).[4]

However, direct evidence for links between ACE accuracy and bias and a wider range of personal and social well-being indicators is, still lacking. The present studies aimed to test the hypothesis that a contextualized assessment of ERA will be a significant predictor of personal and social well-being. We utilized different measures of personal and social well-being and employed diverse samples across different cultural groups. A central question within the scope of these studies was whether a traditional hit rates approach or a typical non-contextualized performance test could provide information similar to the accuracy and bias approach using the ACE.

Study 1 aimed to test the association of accuracy and bias with personal well-being across several world cultures. Study 2 tested the relationship of accuracy and bias with social well-being in the context of daily social interactions in a community sample from the Czech Republic. Study 3 combined the designs of the first two studies by assessing both the personal and social indicators of well-being in a daily social interaction study in Germany. Following the theoretical premise regarding the relation between emotion competencies and well-being (Elfenbein et al., 2007; Schmidt-Mast & Hall, 2018) we postulated that perceptions of day-to-day interaction quality would mediate the relation between emotion perception and well-being.

3. Study 1

Study 1 provided a first test of the hypothesis that higher personal well-being would be associated with higher ERA (in terms of higher ACE accuracy and lower ACE bias) but not with traditional hit rates.

3.1. Method

3.1.1. Participants and procedure

The dataset originates from a cross-cultural study pre-registered to examine cultural variance in attachment styles and the perspective of self versus others (available at https://osf.io/452bq/?view_only = 0a9c625682a942c1b177fe7cd10a08cf). The specific hypotheses of the current analysis were not included in the pre-registration. Initial questionnaires and instructions were created in English and subsequently translated into the languages of the participating study sites using a collaborative translation method as recommended by Harkness et al. (2010). All non-English scales and tasks were first translated by native speakers, and then checked by a team member (fluent in both English and the local language) to ensure it was understandable, meaningful, familiar, and appropriate for the respective cultural context. The specific data presented here have not been previously published.

Participants from twelve countries —China, Germany, Greece, India, Ireland, Italy, Japan, Poland, Spain, Turkey, the UK, and the US— took part in a web-based survey focusing on social relationships and cognitive styles. The countries were selected with the aim to have a good mix of cultures from different parts of the world in terms of key cultural orientations, such as variation in individualism/collectivism (Hofstede, 2001) and honor/face/dignity (Vignoles et al., 2024).

In the absence of previous studies on the topic, to ascertain power, we followed previous multisite cross-cultural research that included variables similar to the cognitive predictors we employed (e.g., Rudnev et al., 2024). An a-priory power analysis (Faul et al., 2009) assuming a small to medium effect size of $f^2 = 0.07$, targeting power of 0.80 and an alpha level of 0.05, suggested a sample size of 141. All of the sites well exceeded that number (See Table S2 for a breakdown of the data collection process and sample demographics.) The final data set included 2440 participants (1653 women, 775 men, and 12 non-binary individuals) with an average age of 24.4 (*SD* 7.81) years. After data collection we conducted a multilevel power analysis using the simr package in R (Green & MacLeod, 2016) which indicated the resulting sample size is sufficient to detect medium Level 1 effects with a statistical power of 86.10 %, 95 % CI [83.80 %, 88.19 %].[5]

The survey was administered through Qualtrics for participants in the US and the UK, and Lime Survey for those from all other countries. All participants were university students over the age of 18. On average, the survey took about 35.6 min to complete (SD 15.5 min). To ensure data quality, we excluded participants who completed the survey in under 10 min and those who failed attention checks. This led to a reduction in the sample size from 2618 to 2440 participants. The ethics research committees of University XXX and of those partner institutions where additional ethics approval was required, approved the study.

3.2. Instruments

3.2.1. Emotion Recognition accuracy

We used a brief version of the Assessment of Contextualized Emotions (modelled after ACE-brief, Kafetsios & Hess, 2022) to assess ERA. Participants saw a series of 20 images showing four emotions (sad, happy, angry, disgust) expressed by a man and a woman, who were depicted either alone or surrounded by two other individuals of the same gender who showed either the same (congruent) or a neutral expression (incongruent). There are 18 different pictures (9 men) depicting emotion in context (9 incongruent) and 2 pictures (1 man, 1 woman) depicting a single person showing a happy expression. Stimuli were selected from the ACE-full (Hess et al., 2016) based on their high test–retest reliability as assessed in previous research (see Kafetsios & Hess, 2022, study 7).

The ACE-Faces stimuli (see Fig. S1 for an example) were produced from a set of *spontaneous* facial expressions that were filmed during a social interaction in which groups of three friends talked about a shared emotion eliciting event. Participants' task was to rate, on a seven-point scale, the central person's emotion expression in terms of the perceived intensity of seven emotions: calm, fear, anger, surprise, disgust, sad, happy. The major scoring dimensions of the ACE are *accuracy* (the

[4] The MSCEIT faces part is consistently found to have strong inverse correlation with ACE bias (Hess et al., 2016; Kafetsios & Hess, 2022).

[5] But see Nezlek (2010) for considerations regarding multilevel power in cross-cultural research.

ntensity ated for the target emotion scale, i.e., anger ntensity on the anger scale for an angry expression of both congruent and ncongruent variations) and *bias* (the mean of ratings on all non-target scales for both ongruent and ncongruent variations) which ave been shown to onstitute two distinct facets of emotion decoding. As shown by Hess et al. (1997) and d scussed by Hess & Kleck (1994) decoding the n-tensity of emotions s not only a valid ndicator of ERA but also a meaningful one, as t captures the nuanced variations in emotional ex-pressions that are essential for accurate nterpretation. Hess et al. (1997) showed that as expressions become more ntense, they are more accu-ately identified. This approach provides a more detailed understanding of emotional ecognition n eal-world interactions where ntensity often varies and affects perception.

uracy, bias s ores and t ates were alculated separately for each emotion and later ombined. In line with the truth and bias model of social perception (West & Kenny, 2011) CE accuracy and bias a e two d mensions which – even though theoretically ndependent – are typically correlated (see Kafetsios & Hess, 2022; average $\gamma_{01} = 0.551$, $t = 13.913$, < 0.001 in the present samples); therefore, when predicting ACE accuracy or bias, t s imperative to account for the espective other variable.

Hit ates were calculated on the same ratings such that 1 was scored when the target s ale (.e., anger for an anger expression) was ated gher than any other scale and 0 when this was not the ase.

Psychological Well-being. The Psychological Well-being S ale s a s ale developed by Diener et al. (2009) to assess an ndividual's subjective well-being o appiness. It s a s ort 8-item summary survey of the person's self-perceived functioning n mportant a eas such as e-lationships, self-esteem, purpose and meaning, and optimism.

single-item measure –*How satisfied are ou with our life?*- is widely used to assess an ndividual's overall life satisfaction or subjective well-being (Diener et al., 1985; Pavot & Diener, 1993).

Loneliness. The 3-item Loneliness Scale s a brief tool developed by Hughes et al. (2004) to assess feelings of loneliness n individuals and the extent to which a person feels socially connected to others: *How often do you feel that you lack companionship? How often do ou feel left out? How often do ou feel isolated from others?* Each question s answered on a 3-point s ale anging from 1 (hardly ever) to 3 (often).

Subjective Social Status was assessed with the use of t e MacArthur Scale of Subjective Socioeconomic Status (dler et al., 2000) a measure that depicts a ladder with 10 ungs which participants use to ndicate one's elative standing in society.

3.3. Results

Descriptive statistics, Cronbach's alpha, and zero-order orrelations of the variables used are s own n Table 1.

3.3.1. Data structure and analysis

The data from the present study ad a nested structure, with atings nested within individuals within countries. We onceptualized the data as a two-level hierarchical structure within countries and analyzed those using HLM software (Raudenbush et al., 2013), following the guidelines by Nezlek (2010). Initially, unconditional models (without predictors at any level) were calculated to estimate the means and variances (both within- and between-persons) of the measures of ACE accuracy and n-accuracy (see Table S1). The nspection of the means ndicates t at participants were generally more accurate than biased n ERA, and a significant portion of the measures' variance was within countries. Re-siduals versus predicted values plots of CE accuracy and bias (see Fig. S2) suggested the model was omoscedastic and t at esiduals versus predicted values elationships were not systemically nvariant.

The main ypotheses nvolved relationships between ACE accuracy and bias (ountry-level centered) and the three well-being ndicators at the ndividual level with no predictors at the culture level, see (1).[6] ll predictors were g oup/culture-mean entred and modelled as andomly varying across ountries. T ese analyses also ontrolled for gender (uncentered) and age (see Table 2).

(1) Level 1: $_{ij} = b_{0j} + b_{1j}{*}\,ccuracy + b_{2j}{*}Bias + b_{3j}{*}Gender + b_{4j}{*}\,e + _{ij}$

Level 2: $b_{0j} = {}_{00} + u_{0j}$

$$b_{1j} = {}_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

As depicted n Table 2, CE accuracy was positively associated with subjective well-being and life satisfaction whereas CE bias was posi-tively associated with loneliness. We calculated the effect size for the full model ompared to a null model n t ee ases (Peugh, 2010) to be around $f^2 = 0.025$. separate set of analyses ncluding gender and age but t s time with t ates as t e predictor of t e three well-being outcomes d d not eveal a s gnificant elationship between t ates and any of the three well-being ndicators ($\gamma_{01} = 1.547$, $t = 1.141$, $= 0.203$). Hit rates were significantly associated with gender (women ad gher t rate accuracy $\gamma_{02} = 0.026$, $t = 2.613$, $= 0.024$) and age (older persons had lower t rate accuracy $\gamma_{03} = -0.001$, $t = -4.055$, < 0.001).

Given known elationships between social status and ERA (Kraus et al., 2010) and CE n particular (Kafetsios et al., 2024) and social status and well-being (Yu & Blader, 2020), we exploratorily tested ef-fects of subjective social status (dler et al., 2000) n t e above e-lationships between CE accuracy and bias and the t ee well-being indicators. Entering Subjective Social Status (SSS) in equation (1) ($\gamma_{05} = 0.423$, $t = 15.842$, < 0.001) rendered the elationship between CE accuracy and life satisfaction non-significant ($\gamma_{04} = 0.119$, $t = 1.690$, $= 0.119$). There was no evidence for SSS affecting the elationships between CE accuracy and psychological well-being o CE bias and loneliness and SSS maintained significant associations with psycholog-ical well-being[7] ($\gamma_{05} = 1.606$, $t = 14.875$, < 0.001) and loneliness ($\gamma_{05} = -0.237$, $t = -10.091$, < 0.001).

In sum, findings from Study 1 showed that, as predicted, CE ac-uracy was positively associated with subjective well-being and life satisfaction, and CE bias negatively associated with loneliness. By contrast, a t rates assessment of accuracy did not predict either of the three ndicators of well-being.

4. Study 2

Study 2 examined how t e CE elates to social well-being oncep-tualized as emotion experience and perceptions regarding the self and others n everyday social nteractions. People tend to spend much of their active day time (45 % according to U.S. Bureau of Labor Statistics, 2016) n the presence of another person. Everyday social encounters are

[6] Given that some of the samples were ollected after the onset of the S RS-CoV-2 pandemic, we included the time elapsed since the start of COVID-19 as a control variable n the main analyses (see Table S17) to account for potent al COVID-related behavioral effects. However, t ere were no s gnificant o meaningful differences n t e results when this variable was ncluded compared to the eported analyses.

[7] We also un exploratory analyses that also ncluded ndependent and nterdependent self-construal as predictors of well-being. Whereas Indepen-dence and nterdependence ad significant, positive elationships with psy-ological well-being ($\gamma_{05} = 5.084$, $t = 17.866$, < 0.001, $\gamma_{06} = 1.684$, $t = 12.049$, < 0.001), the positive elationships with accuracy remained signifi-cant ($\gamma_{03} = 1.149$, $t = 3.297$, < 0.01) and the negative relationship with bias approximated significant levels ($\gamma_{04} = -0.945$, $t = -1.980$, $= 0.07$).

Table 1
Study 1 Descriptive statistics, Cronbach's alpha and zero-order orrelations of the study variables.

	1	2	3	4	5	6	7	8
1. ACE accuracy	0.64 – 0.74							
2. ACE bias	0.334**	0.83 – 0.95						
3. Hit ates	0.283**	−0.572**	0.60-0.70					
4. Well-being	0.138**	−0.038	0.064**	0.86 – 0.91				
5. Loneliness	0.024	0.022	0.015	−0.427**	0.63 – 0.83			
6. Life satisfaction	0.050*	0.031	−0.013	0.619**	−0.460**	–		
7. Gender	0.092**	−0.142**	0.116**	0.061**	0.021	0.023	–	
8. ge	−0.007	0.013	−0.035	0.186**	−0.127**	0.120**	−0.104**	–
ean	3.35	1.82	0.40	41.71	5.31	6.70		24.41
SD	0.57	0.41	0.18	7.97	1.73	1.93		7.81

Note. N = 2440. Cronbach alpha variation within the 12 samples in the diagonal. The orrelations are presented to facilitate omparisons with esults from previous research. Such orrelations confound between- and within-group variability (Nezlek, 2010), and therefore provide potentially inaccurate descriptions of relationships. * < 0.05. *** < 0.001.

Table 2
Study 1 Multilevel model of elationships between ACE accuracy and Bias and three Well-being ndicators.

	Well-being			**Life satisfaction**			**Loneliness**		
	Coef.	SE	t-value	Coef.	SE	t-value	Coef.	SE	t-value
Intercept γ_{00}	40.360	1.072	37.620***	6.504	0.205	31.689***	5.292	0.141	37.480***
ACE A racy γ_{10}	**1.175**	**0.347**	**5.034*****	**0.198**	**0.074**	**2.683***	−0.089	0.085	−1.049
ACE B as γ_{20}	−0.903	0.621	−1.454	−0.058	0.122	−0.483	**0.354**	**0.074**	**4.734*****
Gender γ_{30}	0.794	0.387	2.050	0.120	0.086	1.382	0.007	0.095	0.076
ge γ_{40}	0.117	0.03	3.787**	0.020	0.006	3.254***	−0.032	0.095	0.076

Note: Coefficients in bold are described in the esults section. Gender oded −1 = males, 1 = females * < 0.05 ** < 0.01, *** < 0.001.

mportant for psychological well-being (Gable & Reis, 2010) and decoding emotion expressions is an important skill for successful social interactions (Calvo et al., 2014).

4.1. Participants and ocedure

Determination of the sample s ze was based on previous social interaction event sampling esearch using the CE (Hess et al., 2016). The present study ncluded 279 participants[8] (193 women) aged 18 to 35 years (M = 23.13, SD = 4.85) reporting 5,331 social interactions (M = 19.11, SD = 12.741, ange 1 to 85 social nteractions). power analysis onducted using the *simr* package (Green & MacLeod, 2016) indicated that a sample size of approximately 280 individuals provides sufficient statistical power (91.50 %, 95 % CI [89.60 %, 93.15 %]) to detect medium L2 effects.

Participants were ecruited via non-probability sampling methods from the ommunity n the Czech Republic through social media advertisements, local newspaper announcements, and posters n public spaces. The data collection procedure encompassed several phases, both online and n laboratory settings, as detailed n t e supplementary file. The present analysis focuses on the diary study part. This dataset forms part of a larger pre-registered project (ttps://osf.io/pu56h/?view_only = 3fbcf8042fa34383b68dc436ae404dd9) which eceived approval from the University [Blinded for eview] esearch ethics ommittee T e specific data eported ere ave not been published elsewhere.

4.2. Instruments

Emotion Recognition acy. We used a b ef version of the Assessment of Contextualized Emotions (see Kafetsios & Hess, 2022) to assess ERA. Participants saw a series of 24 images showing four emotions (sad, happy, angry, disgust) expressed by one man and one woman, who was shown either alone or surrounded by two other individuals of the same gender who showed either the same o a neutral expression. Similar to the version used for Study 1, 16 different pictures (8 men, 8 women) depicted emotion expressions n ontext. Further 8 d fferent pictures depicted emotion expressions shown by s ngle ndividuals. Stimuli were selected from t e ACE-full (Hess et al., 2016) based on their gh test– etest reliability as assessed n previous esearch (see Kafetsios & Hess, 2022, study 7). Accuracy, bias scores and t rates were alculated separately (as for Study 1) for each emotion and later ombined. ACE accuracy and bias were orrelated (average (279) = 0.501 in the present sample.).

The Faces subtest of the ayer, Salovey, Caruso EI Test (MSCEIT, Mayer et al., 2003) ncludes photographs of four subtly emotional faces. For each face, participants were asked to rate the degree towhich each of five emotions (happiness, fear, surprise, d sgust, excitement) a e present, using a 5-point scale anchored with 1-not at all present and 5 –very much present. Different emotion terms were used for different faces. The teria for s oring esponses as orrect or ncorrect were established based on t e onsensus of a separate large sample of observers who collectively determined the emotional expressions depicted by the facial stimuli (Mayer et al., 2003).

4.3. *Diary study*

fter ompleting t e CE and the other measures, participants completed the Rochester Interaction Record (RIR; Nezlek, 2010) on ten consecutive days to rate each interaction (lasting at least 10 min) they ad during each day (5,331 social nteractions 1–85 nteractions, average 1.91 interactions per day). T ey rated t e interaction on seven-point s ales measuring t e quality and emotion experienced and perception of that nteraction n terms of: own positive (joy, alm, enthusiasm, alertness, security) and negative emotion (regret, anger, anxiety, pressure, s ame, ejected), perceived expression of positive and negative emotion by the nteraction partner, as well as perceived emotional support, support satisfaction, and avoiding expressing emotion to the other.

[8] Initially, 338 (238 women) participants aged between 18 and 35 years (M = 23.24, SD = 4.92) completed the first, questionnaire, phase. Of those, 59 participants were excluded for failing to complete one of the other study phases.

4.4. Results

4.4.1. Data structure and analysis

We used a series of multilevel andom coefficient models to analyze this multi-level dataset using HLM software (Raudenbush et al., 2013). Initially, unconditional models were calculated to estimate the means and within- and between-persons variances of the measures of CE accuracy and naccuracy. significant portion of the measures' variance was within persons (see Table S3.) The nspection of the means ndicates that participants were generally more accurate than biased n ERA (Accuracy $M = 5.206$, $SD = 0.763$, Bias $M = 2.31$, $SD = 0.568$).

As shown n Table 3, CE accuracy positively predicted own positive affect and positive affect shown by the nteraction partner during t e interaction as well as perceived social support and support satisfaction. By ontrast, CE bias positively predicted own negative affect and negative affect shown by the nteraction partner during t e nteraction as well as aving avoided showing emotions during the nteraction. Interestingly, CE bias also predicted own positive affect.

5. Discussion

In a ommunity sample from the Czech Republic, gher ACE accuracy was associated with gher own positive emotions during everyday social interactions as well as perceiving others expressing more positive emotion, being more emotionally supportive and feeling satisfied by their support. Conversely, and independently of accuracy, ACE bias was associated with gher own negative emotion, avoidance to express own emotion and perceiving others expressing more negative emotion. Interestingly, CE bias also predicted own positive affect. This may be because CE bias may also eflect hypersensitivity to emotion and given that most eported interactions were likely at least somewhat positive and n fact just being n social nteractions s often positive (Berry & Hansen, 1996), this hypersensitivity then predicts positive affect as well.

Overall, these esults replicate and extend previous esearch using the full CE method in student samples (Hess et al., 2016) and suggest that ACE accuracy (bias) is associated with gher (lower) quality social interactions, t at ncrease (diminish) apport and attunement n social interactions (see also Kafetsios & Hess, 2019). In Study 3 we directly tested the onjecture t at CE accuracy and bias effects on ndividual-level well-being are mediated by gains and deficits in social nteraction.

6. Study

Studies 1 and 2 provided evidence t at CE Accuracy and Bias a e meaningfully related to aspects of personal (Study 1) and social (Study 2) well-being. Building on these findings, Study 3 utilized t e same personal well-being ndicators as Study 1 and ncorporated an event-sampling (diary study) design, as employed in Study 2. This approach aimed to test whether the perceived quality of daily interactions mediated t e elationship between ACE accuracy, bias, and personal well-being.

6.1. Method

6.1.1. Participants

One undred and thirty-two participants (46 men) with a mean age of 26.23 ($SD = 5.08$, ange 18 to 42 years) took part n the study recruited from a major state university in Germany. s ompensation, participants were given small gifts (spa products, hocolates, etc.). T e study s eported n Hess et al. (2016, Study 3).[9] The well-being data eported here and their relation to ACE accuracy and bias as well as to social interaction quality ave not been reported elsewhere. The sample

[9] The study 3 by Hess et al. (2016) ad a narrower focus, namely on t e relation between emotion perception and social interaction quality.

Table
Study 2 Multilevel analyses.

	PA			NA			Othpos			Othneg			EMSUP			SSATISF			Avoid		
	Coef.	SE	t-ratio	Coef.	SE	t-ratio	Coef.	SE	t-ratio	Coef.	SE	t-ratio	Coef.	SE	t-ratio	Coef.	SE	t-ratio	Coef.	SE	t-ratio
Intcpt. γ_{00}	4.261	0.04	112.002	1.767	0.031	56.038	5.61	0.044	128.042	1.677	0.031	53.190	4.905	0.057	85.476	5.199	0.055	93.683	2.454	0.059	41.453
ge γ_{10}	−0.01	0.008	−1.736	0.012	0.007	1.726	−0.027**	0.010	−2.719	0.004	0.006	0.743	−0.023	0.012	−1.908	−0.017	0.011	−1.502	0.029*	0.014	2.050
Acc.γ_{20}	**0.156****	0.05	2.744	0.022	0.053	0.422	**0.194****	0.073	2.666	−0.025	0.055	−0.453	**0.296****	0.098	3.023	**0.236****	0.087	2.715	−0.160	0.094	−1.696
Bias γ_{30}	**0.215***	0.082	2.605	**0.249*****	0.070	3.539	0.033	0.099	0.340	**0.248*****	0.071	3.458	0.022	0.133	0.170	−0.047	0.129	−0.370	**0.463*****	0.123	3.759

Note: PA – Positive affect, NA – Negative affect, EMSUP – emotional support, SSATISF – Satisfaction with support, void – Avoided expressing emotion to the other, Othpos – Other expressed positive emotion, Otheneg – Other expressed negative emotion, . = CE Accuracy, Bias = ACE B as size is sufficient to detect medium L2 effects with a power of 89.20 %, 95 % CI [87.11 %, 91.06 %] (end & Schäfer, 2019).

6.2. Procedure and measures

In a laboratory task, participants completed the full version of CE-faces emotion perception task (see Hess et al., 2016). Hit ates were calculated as described for Study 1. Prior to the laboratory assessment, participants ompleted a standard questionnaire with various personality measures (see supplementary file). Following the laboratory task, participants eceived nstructions for t e event sampling d ary task. Participants described 3,231 interactions (range from 1 to 87, median 23) using an adaptation of the Rochester Interaction Record (RIR; Nezlek, 2010) t at ncluded eports of Own Positive ffect, Own Negative Affect, Satisfaction with the Interaction, Feeling Understood, Expressed Emotions Openly, Felt epted, Felt Supported, Other Expressed Emotion Openly, Other Positive Emotions, Other Negative Emotions, and Other Well-meaning. Only participants with at least 1 record and no missing level 2 variables were ncluded n the final sample which esulted n 115 participants (25 men, 90 women, $_{age} = 25.817$, $SD = 5.098$) and 2,818 nteraction records. One day after the last day of the d ary task, participants ompleted again t e same well-being n-dicators which were ncluded n Study 1 and were fully debriefed. T e Faces subtest of the ayer, Salovey, Caruso EI Test (MSCEIT, Mayer et al., 2003) was also ncluded in this study.

6.3. Open practices statement

The esearch was not preregistered. ll data, syntaxes, and materials are openly available ttps://osf.io/krj3a/?view_only = d73e05f743614797b76d18e605bf2b72.

6.4. Results

Descriptive statistics, Cronbach's alpha, and zero-order orrelations of the study variables at level 2 are presented n Table 4. CE bias was negatively elated to psychological well-being. In a series of multiple regressions, we egressed the three well-being ndices on ACE accuracy and bias also entering MSCEIT faces s ores. Including MSCEIT faces scores did not meaningfully alter t e esults presented n Table 4. In similar analyses ontrolling for t ates, t rates did not significantly predict any of the well-being ndices over and above the two ontextualized ERA ndicators. However, ontrolling for t rates strengthened the associations between ACE accuracy and bias eported n Table 4.

6.5. Multilevel structural equation modelling (MSEM) analysis

In this analysis, each ndividual represents a luster (level 2 of the erarchy) consisting of several diary entries (level 1). Using the notation proposed by Krull & MacKinnon (2001), the structure of the model can be labeled as 2–1–2. because both the ndependent and dependent variables are onstant within each individual. but the mediator variables vary among diary entries. ore precisely, t e model as a (2.2)-1–2 structure, as there are two orrelated ndependent variables – ACE accuracy and CE bias.

Preacher et al. (2010) showed extensive evidence that the multilevel structural equation modeling (MSEM) paradigm s adequate and t e most powerful approach to investigate mediation effects in multilevel data. SEM can effectively separate within and between subject variance and preserves statistical power while avoiding spuriously nflating power for the test. We employed this approach to test our ypothesis. s interaction quality was measured on level 1, we assume that there a e two sources of the ndicators' variance: the variance stemming from the variability of everyday nteractions and t e variance associated with more stable psychological traits of study participants. The latter onstitutes the latent mediator variable.

The analyses were performed n R (version 4.2.2, R Core Team. 2022) using lavaan package version 0.6–17 (Rosseel, 2012). Parameters were estimated using bootstrap esampling. Intraclass orrelations of level 1 variables ranged from 0.22 to 0.40 (median 0.28) indicating a sufficient amount of variability between lusters.

Fig. 1 shows t e structure of t e model with standardized o-efficients. ll loadings in the Figure d ffer significantly from zero with the exception of the direct effects of ACE accuracy (0.13, CI95 = [-0.07, 0.33]. p = 0.194) and CE bias (−0.10, CI95 = [-0.31, 0.10], p = 0.330) on well-being. However, both ndirect effects significantly d ffer from zero, with a positive sign for CE accuracy (0.11, CI95 = [.02, 0.21], p = 0.023) and with a negative sign for CE bias (−0.17, CI95 = [-0.28, −0.06], p = 0.003). In sum, the findings support the ypothesis that ERA mediates the effect of perceived nteraction quality during a 10-day period on subsequently assessed well-being. Note that the observed effects ave ather small to medium magnitudes. Considering both d ect and ndirect effects, well-being ncreases by 0.24 standard deviations when CE accuracy ncreases by one standard deviation and −0.27 standard deviations for CE bias. The model explains 23.9 % of the variance.

7. General discussion

Emotion Recognition uracy (ERA), the accurate evaluation of others' emotional expressions and feelings is a fundamental human skill essential for the egulation of nterpersonal elationships and overall social functioning. Yet, existing evidence supporting t s elationshi p has been scarce (Lanciano & Curci, 2015; Sommer & Schlegel, 2024). We predicted that much of this failure was due to the way ERA has been assessed n these studies. We proposed that the use of a ontextualized assessment of ERA, which does justice to the social nature of this task, would allow to highlight the ole of ERA for well-being. For this, we used the ssessment of Contextualized Emotion (ACE), which nfuses social ontext by ncluding a naturalistic g oup setting and d stinguishes

Table 4
Study 3 descriptive statistics, zero-order and partial correlations of the study variables.

	1	2	3	4	5	6	7	8	9
1 CE accuracy	0.871								
2 CE bias	0.377***	0.963							
3 Well-being	**0.184***	**−0.192***	**0.872**						
4 Life satisfaction	**0.204***	**−0.194***	**0.759*****	–					
5 Loneliness	**−0.13**	**0.270****	**−0.637*****	−0.534***	0.793				
6 MSCEIT faces	0.145	−0.492***	0.192*	0.136	−0.210*	0.864			
7 Hit ates	0.660***	−0.688***	0.094	0.128	−0.112	0.194*	0.816		
8 Gender	−0.174*	0.183*	−0.294***	−0.367***	0.204*	−0.188*	−0.228**	–	
9 Age	−0.217**	0.039	−0.264**	−0.319***	0.244**	−0.081	−0.172*	0.267***	–
ean	5.099	2.321	5.363	3.784	1.692	54.413	0.525	0.293	26.227
SD	0.645	0.465	0.91	0.961	0.59	10.485	0.135	0.457	5.083

Note. With bold are esults from partial orrelations that control of t e espe ctive other ACE accuracy index (Bias for Accuracy and t e nverse). C onba alphas in the diagonal. Gender: 1 Male, 0 Female * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

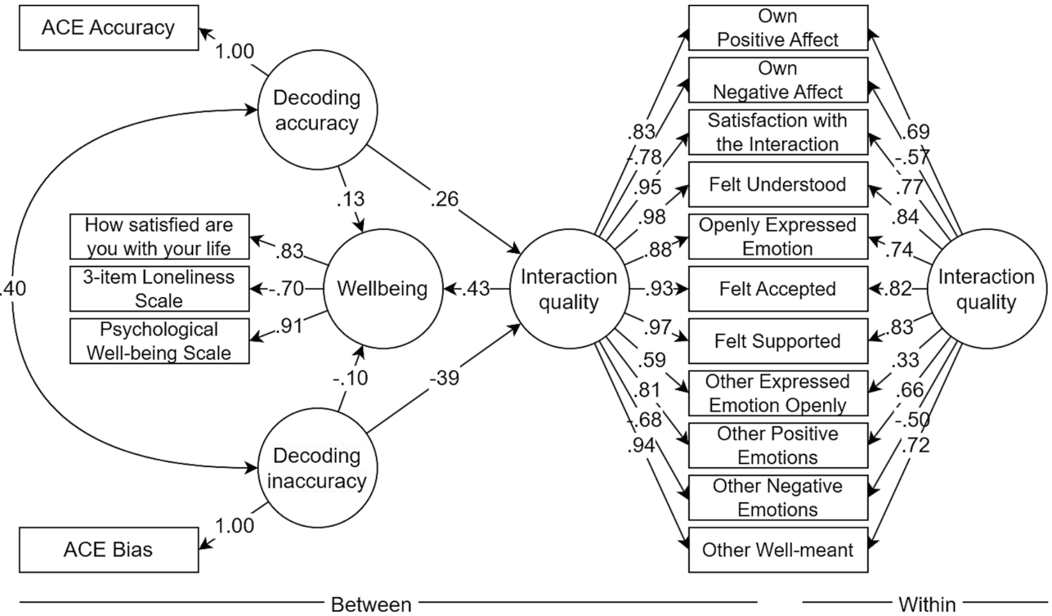

Fig. 1. Study 3 MSEM model with estimated standardized oefficients.

accuracy (the accurate assessment of t e intended emotion) from bias (the perception of secondary emotions additional to the ones presented).

In three studies involving more than 2800 participants from 13 world cultures and more than 6000 social nteractions in two of t ose ultures, we found onsistent relationships between a ontextualized assessment of ERA and personal and social well-being. Specifically, n Studies 1 and 3 CE accuracy was associated with gher personal psychological well-being and life satisfaction whereas CE bias was associated with gher loneliness. oreover, n Study 3 CE bias was negatively associated with psychological well-being and life satisfaction. These findings support the dea of a truth and bias model in emotion perception (West & Kenny, 2011) and pave the way for t e identification of different l kely processes that link ERA with well-being.

t a personal level, CE accuracy nvolves agentic ways of perceiving others (Kafetsios et al., 2024; Magee & Galinsky, 2008) and this agentic nature of engaging with t e social world can account for gher personal and social well-being. Conversely, bias nvolves more stereotypical, culturally shared, less accurate representations of the social world (Hess et al., 2016), and such biases ave shown to ncrease loneliness (Wols et al., 2015) n line with a socio-cognitive skills theory of loneliness (Cacioppo & Hawkley, 2009).

In all studies, neither a t rates assessment of ERA as typically used n previous esearch nor a standard assessment of non-contextualized emotions (MSCEIT-Faces, Studies 2 & 3) were associated with social or personal well-being. We surmise that a significant factor ontributing to weak o null findings on links between ERA and well-being to date as been the eliance on ontextless facial information for the assessment of ERA. Hess and Kafetsios (Hess & Kafetsios, 2021; Kafetsios & Hess, 2023) ave posited that the use of such materials enders the task non-social and engages d fferent b ain egions that are l nked more to ognitive problem solving t an a social perception task (see ntypa et al., 2024). As such, even t ough the use of such measures can assess one way of decoding emotions, namely t ough pattern matching as suggested by Buck (1984), t does not adequately capture what people do when they interact with others. In real life interactions people recruit their emotion knowledge to engage in perspective taking, allowing t em to nfer their interaction partners' emotional states based on a b oader data base than the s mple movement of facial muscles. In this vein, Antypa et al. (2024) found that using an ACE type emotion task does, ndeed, ecruit brain areas associated with theory of mind, whereas t e simple task of applying a label to a ontextless emotion expression does not.

second important findings of the present esearch is the demonstration of a link between ERA and perceived social interaction quality. Specifically, ow others a e approached n social nteractions, t e emotional apport one has (and perceives to have) with others n social interactions, a e important facets of well-being as demonstrated n Study 2 and 3. This s in line with key theoretical views on the social s gnificance of ERA for well-being (Hall et al., 2009; Palese & Schmid Mast, 2020). Yet, to date these theoretical models have seen little empirical support. In fact, to our knowledge, the present esearch is the first to present such evidence. Partially replicating previous esearch with student samples (Hess et al., 2016) Study 2 found that the quality of everyday social nteractions in a ommunity sample n t e Czech Republic was gher (lower) for participants with gher CE accuracy (bias). Higher quality of social nteractions was eflected n gher eported own positive emotion, and mportantly, more positive perceptions of others' positive emotions. Results from multilevel Structural Equation Model analyses n Study 3 revealed that a large proportion of the o-variation of ACE accuracy and bias and personal well-being s due to quality of social nteraction.

s such, t e present findings support a long-standing assumption that gher ERA can streamline and synchronize nterpersonal ommunication and emotional nteractions among people (Feldman et al., 1991; Niedenthal & Brauer, 2012). Schmid Mast and Hall (2018) ave noted a "black box" between accurate nferences about others and social nteraction outcomes, with l mited evidence that (and ow) ERA an improve these outcomes. Results from the present studies linking CE accuracy (bias) with positive (negative) expectations about t e nteractants' emotional state and well-being outcomes, provide some nsight nto this black box and help explain how the accurate perception of others' emotional expressions an lead to orrect nferences and adaption to others' behavior n line with t e Behavioral daptability Model (Schmid Mast & Hall, 2018).

7.1. Limitations and future directions

number of limitations equire addressing. Firstly, ausal paths between ERA and personal and social well-being cannot be drawn on t e basis of the present esearch alone. Secondly, the data were drawn from studies originally conducted with somewhat d fferent esearch questions in mind. s such, only two traditional approaches to ERA (t rates and the MSCEIT Faces) were ncluded, limiting generalizability to other measures. Future esearch ould directly address this limitation. Finally, in all studies we observed small to medium effects, not uncommon n esearch that ombines cognitive with self-report methodology (adi & Diener, 1989; Podsakoff et al., 2003); in some cases, the sample power to detect small effects was l mited, f onsidering all the parameters of t e multilevel study designs (end & Schäfer, 2019). Nevertheless, esults replicate very well across different samples, cultures and using different variants of t e ACE method. Study 3 replicated study 1 findings on e-lationships between uracy and B as and personal well-being, whereas Study 2 eplicated esults from Hess et al. (2016) social nter-action studies taken place with student samples in a d fferent culture and using a different variant of the CE measure.

The esults from the present esearch pave a first step for the use of a ontextualized approach to ERA to understand ts effects for social nteraction outcomes. Future esearch ould also test the d fferential effects of ACE accuracy and bias for synchrony at individual and dyadic level (Macpherson & Miles, 2023), attunement and rapport (Palese & Schmid Mast, 2020; Reis et al., 2017) o active listening (Itzchakov et al., 2022) and for different populations likely to vary n t eir levels of ERA. t a b oader level, and with an eye to nforming well-being, further esearch could also test ollective effects of contextualized ERA skills for social networks outcomes (to see ow ERA skills differ across d fferent see Hypsova et al., 2024 for promising early findings). Finally, a direct mplication of the present esearch s to further understand t e per-sonality and social onstituting factors of accuracy and bias (Kafetsios & Hess, 2022) and ow anges n t ose onstituting factors an affect anges n personal and social well-being (Joshanloo, 2024).

8. Conclusion

Despite strong theoretical predictions for a positive association be-tween Emotion Recognition uracy (ERA) and well-being, to date, empirical support for t s elationship as been very limited. Results from three studies provide for the first time evidence that a ontextu-alized assessment of ERA is a unique, onsistent, and meaningful pre-dictor of personal and social well-being. These effects were partially mediated by social nteraction quality n eal-life social and personal relationships. The studies advance our understanding of ERA, and open up the possibility to pose and empirically test new questions about ERA's and social perceptions or social functions.

CRediT authorship contribution s atement

Konstantinos Kafetsios: Writing – eview & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data uration, Conceptualization. **Ursula Hess:** Writing – eview & editing, Data uration. **Daniel Dostal:** Writing – original draft, Formal analysis, Data uration. **Martin Seitl:** Writing – eview & editing, Funding acquisition, Data uration. **Petra Hypsova:** Writing – eview & editing, Project administration, Data uration. **Shlomo Hareli:** Writing – eview & editing, Data uration. **Itziar Alonso-Arbiol:** Writing – eview & edit-ng, Data uration. **Astrid Schütz:** Writing – eview & editing, Data uration. **Dritjon Gruda:** Writing – eview & editing, Data uration. **Kelly Campbell:** Writing – eview & editing, Data uration. **Bin-Bin Chen:** Writing – eview & editing, Data uration. **Marco J. Held:** . **Shanmukh Kamble:** Writing – eview & editing, Data uration. **Takuma Kimura:** Writing – eview & editing, Data uration. **Alexander Kirchner-Häusler:** Writing – eview & editing, Data uration. **Stefano Livi:** Writing – eview & editing, Data uration. **Eugenia Mandal:** Data uration. **Dominika Ochnik:** Data uration. **Ezgi Sakman:** Data uration. **Nebi Sumer:** Writing – eview & editing, Data uration. **Annalisa Theodorou:** Data uration. **Ayse K. Uskul:** Writing – eview & editing, Data uration.

Declaration of ompeting nterest

The authors declare that they have no known ompeting financial interests o personal elationships t at ould have appeared to nfluence the work eported n this paper.

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uthor Contributions

KK developed the esearch oncept, conducted analyses n the first and second study and drafted t e MS. All authors ontributed to t ans-lation of materials, onceptual feedback and data ollection. DD on-ducted the analyses presented in the third study and power analyses n all studies. ll authors ontributed to translation of materials, concep-tual feedback and data ollection. All authors approved the final version of the manuscript for submission.

Appendix A. Supplementary data

Supplementary data to this article can be found online at ttps://doi.org/10.1016/j.jrp.2024.104556.

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