



# Extraversion Affects Attentive Processes of Personal Images

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**Abstract.** Personality traits are an important part of the psychology with so many study to consider this actually a huge field. On the other hand, the relationship between personality traits and attentional process has not been deepened yet, above all using technological advanced measures to quantify attention. In this study we selected personal and neutral photos presenting all of them to the participants while tracking the eyes movements by using an eye-tracker. Results showed that personal images have in general higher number of fixation and more saccades. Specifically, while extroverts showed no differences in exploring personal and neutral photos, introverts participants showed an higher number of fixations and more saccades for personal images than neutral. These results if confirmed in further studies pose interesting questions about the role of personality in attentional processes linked to personal experiences.

**Keywords:** Psychometrics · Personality · Attention · Personal images  
Extraversion · Eye-tracking

## 1 Introduction

Photos and other images are quite simple and efficient tool to be used for induction where are proposed as stimuli for experimental psychology [1]. On the other hand the use of personal image provided directly by the participants to the experiment are very rare. One of the main problems that makes personal images not so used is that they are not able to be standard, by definition.

As empirical based science, psychology need to use standard tests that can be replicated and so used also for other studies [2]. However the chance to use personalized stimuli can be a catalyst for new ideas and indeed been empirical science.

Personalized stimuli can be used, for example for working with episodic memory pushing both cognitive psychology and emotional science [3].

## 1.1 Toward an Integrated Approach

Since we used a personalized tool, the experimental complexity increased a lot and the risk of biases was to be taken into serious consideration.

Even if standardization of experimental stimuli remains in our opinion very crucial, there are different situations or studies, in both clinical and experimental settings, in which the enrichment of personal cues might be crucial and keen. The role of emotions and episodic memory, might be related to personal images in a very strong way [4]. Potentially these aspects could be driver of our behavior already in focus attentional process and so having an impact in decision making processes and other outcome of consequent actions [5].

Our hypothesis, in this study, was to find a preliminary evidence of a relationship between personal images and focused attention measured with eye-tracking, being this an objective and reliable instrument to catch such a sensible and fast construct such as the attention.

Moreover, we hypothesized that some personality traits were able to affect this relationship, and in particular we considered that more introvert people was prone to focus more on personal image, being them more focused on their own sphere than the social one.

## 2 Materials and Methods

### 2.1 Participants

Twenty-three students (19 females) attended the Faculty of Psychology at the Catholic University of Sacred Heart of Milan, Italy, and took part in the experiment. All the participants were students, also in psychology or communication, but without previous knowledge of eye-tracking and in particular with no knowledge of the attentional processes investigated in the experiment. Social, economic, cultural and historical background were all similar since all the participants were student in the same University and with similar background. They were first met by one of the researchers during academic courses or through personal contacts and then contacted via mail and/or telephone to schedule a meeting at the laboratory where the eye-tracker were installed. The topics associated with the experiment were not mentioned during academic courses or personally.

Two of the participants failed to complete the experimental session due to personal or technical problems and were excluded from statistical analyses. The final sample was composed of 21 students, who were assessed with the TIPI personality test [6] to be considered more or less introverts or extroverts.

### 2.2 Procedure

Participants were contacted months before of the experimental session and were required to provide soon after 30 personal photos mixing people and places. Xx of these photos were selected by a psychology researcher to be comparable with the neutral photos. An analysis of perceptive salience of all the photos has been done by

using Matlab, in order to ensure that all the stimuli were not able to grab the attention due to perceptual processes.

Researchers then created specific algorithms to include all the photos of each participant in the pipeline to be presented to each subject as her/his own personal stimulus but mixed with the neutral photos.

Once in the laboratory the day of the experiment, the participants were required to fulfill some questionnaires. In particular the TAS-20 for alexithymia [7]; State Traits Anxiety Inventory, STAI-Y [8]; TIPI for personality [6]; and finally the Self Assessment Manikin SAM [9], for evaluating perceived level of physiological arousal, emotional valence, and dominance.

At this point the experimental task started. The participants were required to watch the monitor in front of them, staying still, while the head position was kept through an opportune hardware support for the chin. The photos were showed from the custom algorithm while the eye-movements were tracked at the same time.

### 2.3 Signal Acquisition and Data Analysis

The experiment was carried out in the labs, equipped with two portable PCs, one for delivering the stimuli and the other for acquiring eye-tracker data.

The pupillometry data were acquired using an Eye-link 1000, including experimental design software to record all raw signals, then exported and resampled at 1000 Hz.

In our study, by using the eye-tracker data extraction, we obtained for each participant a matrix of gaze and pupil data corresponding to each stimuli presentation (all the personal and neutral photos); in particular, we collected 1000 rows for each second (sampling to 1000 Hz), thereby making it possible to establish the exact period of each stimulus in the pipeline.

The software for the eye tracker was programmed to process the eye-movement indicators in terms of the number of fixations and saccades, that quantify the level of attention spent in each photo.

## 3 Results

Results have been highlighted following. In particular, we reported the descriptive statistics for both the questionnaires (Table 1) and for eye-tracking indexes (Table 2).

Within, between and interaction effects are highlighted in a  $2 \times 2$  mixed experimental design with the *within condition* (Personal vs. Neutral) by the *between condition* TP score (extroverts vs. introverts) (Table 3).

Results showed that personal images have in general higher number of fixation and more saccades (Fig. 1). This means that participants were more prone to focus to personal images than neutral, but this was of course expected, being the photo personal. Indeed, the interesting result is the different attentional levels of introverts and extroverts. In fact, while extroverts showed no differences in exploring personal and neutral photos, introverts participants showed an higher number of fixations and more saccades for personal images than neutral (Table 2 and Fig. 1).

**Table 1.** Descriptive statistics for questionnaires

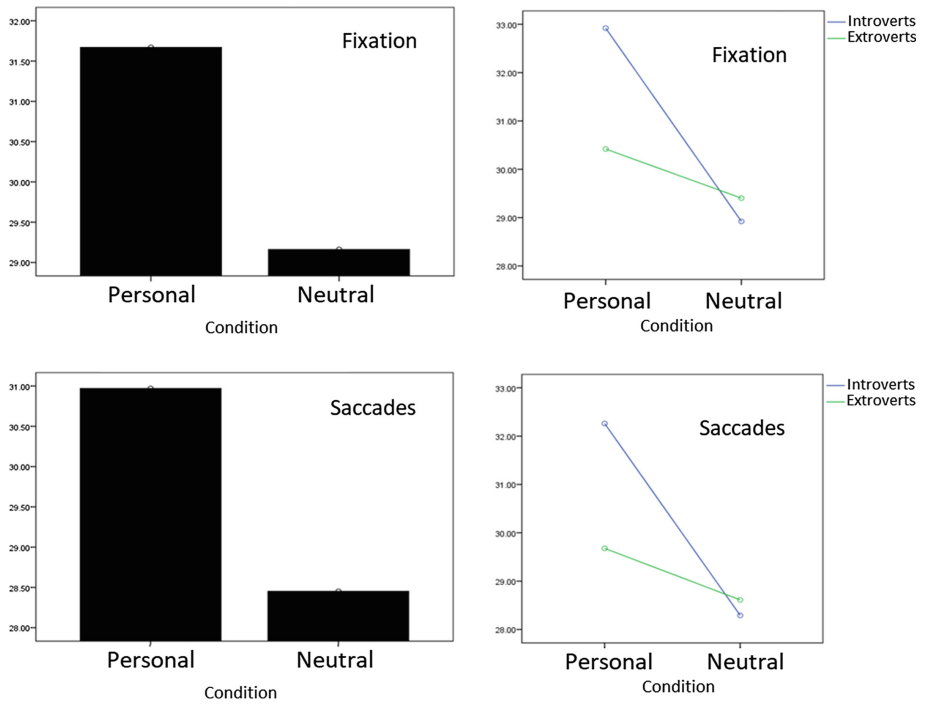
Measure	N	Min	Max	Mean	St. Err.	St. Dev.
STAI (state)	21	26	50	35.05	1.319	6.045
STAI (traits)	23	29	62	41.61	1.851	8.877
TAS score	23	28	58	42.39	1.851	8.877
TP score E	23	2.00	7.00	4.9130	.33216	1.592
TP score A	23	3.50	7.00	5.3913	.21769	1.043
TP score C	23	2.50	7.00	5.6522	.25814	1.237
TP score N	23	1.50	6.50	3.5652	.23587	1.131
TP score O	23	2.50	7.00	5.2609	.24726	1.185
SAM score (valence)	22	1.27	2.64	1.9008	.09456	.44351
SAM score (arousal)	22	1.55	3.64	2.4545	.12446	.58379
SAM score (dominance)	22	2.82	4.73	3.8182	.10514	.49316

**Table 2.** Descriptive statistics for eye-tracking indexes

Measure	Measure type	Condition	Personality	Mean	St. Dev.	N
Average duration of eye blinks	Attention	Personal photos	Introverts	108.6841	48.22675	8
			Extrovert	158.3728	32.25470	13
			Total	139.4438	45.27270	21
		Neutral photos	Introverts	157.2698	83.46548	8
			Extrovert	182.4577	62.22686	13
			Total	172.8623	70.13327	21
Number of fixations	Attention	Personal photos	Introverts	32.9205	5.18249	8
			Extrovert	30.4196	4.25359	13
			Total	31.3723	4.66957	21
		Neutral photos	Introverts	28.9217	3.00181	8
			Extrovert	29.4030	3.74981	13
			Total	29.2196	3.41288	21
Number of saccades	Attention	Personal photos	Introverts	32.2614	5.29361	8
			Extrovert	29.6783	4.29180	13
			Total	30.6623	4.74465	21
		Neutral photos	Introverts	28.2912	3.09526	8
			Extrovert	28.6119	3.77153	13
			Total	28.4897	3.45158	21
Mean pupil dilation	Emotional intensity	Personal photos	Introverts	1,052.3041	258.35748	8
			Extrovert	940.8391	304.43339	13
			Total	983.3019	286.43734	21
		Neutral photos	Introverts	1,045.7377	303.52697	8
			Extrovert	919.8932	269.47547	13
			Total	967.8340	282.37695	21

**Table 3.** Univariate tests for eye-tracking indexes

Experimental condition	Measure	F	Sig.	Partial Eta <sup>2</sup>
Condition ( <i>within factor</i> )	Average duration of eye blinks	10.514	<b>.004</b>	.356
	Number of fixations	12.301	<b>.002</b>	.393
	Number of saccades	12.188	<b>.002</b>	.391
	Mean pupil dilation	.548	.468	.028
Condition X TP score entroversion/extraversion ( <i>interaction</i> )	Average duration of eye blinks	1.195	.288	.059
	Number of fixations	4.349	<b>.051</b>	.186
	Number of saccades	4.051	<b>.059</b>	.176
	Mean pupil dilation	.150	.703	.008
TP score entroversion/extraversion ( <i>between factors</i> )	Average duration of eye blinks	2.628	.121	.122
	Number of fixations	.355	.558	.018
	Number of saccades	.432	.519	.022
	Mean pupil dilation	.874	.362	.044



**Fig. 1.** Fixation and saccades in both personal and neutral photos for both introverts and extroverts.

This indicates that the difference between personal and neutral images is mostly due to the contribution of introverts that tends to focus significantly more than extroverts when they focus on personal images than neutral.

## 4 Discussion

With this preliminary study we were interested in understanding (1) if personal images were related to attentional processes, and (2) if personality traits, and in particular more introvert people, were more focused on their own personal images than others.

Results showed that the relationship between personal images and attentional processes is crucial, but the extent to which this can be considered so strong to have an effect is still to be verified in further studies.

On the other hand, we faced statistical differences in the attention that introverts dedicated to personal images, where extroverts showed no differences. The results are still too preliminary to draft any conclusions but the effects that, once verified, this could have on the field is really interesting and deserve to be discussed and explored in further works, even exploiting other aspects of personality and also focusing on the whole spectrum of the personality traits than in two opposite extreme.

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