Article

Relationships between High Ability (Gifted) and Flow in Music Performers: Pilot Study Results

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Abstract: Flow state is a positive mental state during which people are highly motivated and absorbed in their activity. This construct has been linked to the creative personality. Creative people differ from each other, but what they share is that they love what they do due to the pure pleasure they derive from their activity. We studied the possible relationship between people with high ability (HA) who dedicate themselves to music (students or professionals) and the flow state that occurs while they are engaged in musical activities (concert or informal event). The “Flow State for Musical Performers” (*Estado de Fluidez para Intérpretes Musicales*—EFIM) was used in this study. The scores of musicians with HA were compared with those of musicians who are not identified as HA. The study used a sample of 101 Spanish people (HA 28.7%, general population 71.3%). No significant statistical differences were identified in any of the EFIM subscales, except regarding the Loss of Self-Consciousness. This suggests a relationship between HA and the experience of flow, particularly with regard to loss of self-consciousness, but also with characteristics of the creative personality (capacity for enjoyment, attention and learning). Limitations of the study and future lines of research are presented.

Keywords: high ability; creativity; flow; attention; music

1. Introduction

The study of high-ability (HA) people presents a diverse range of concepts for defining this collective. It is commonly held that these people possess greater intelligence, and researchers are in agreement as regards their cognitive abilities: fast learning; greater speed understanding large, complex, and abstract problems; good verbal skills; good problem-solving abilities; significant capacity to store and manage information; a good level of understanding; varied interests; and a high level of curiosity as regards their environment [1]. Given these characteristics, it is considered that this collective requires specific educational attention. However, figures provided by the Spanish Ministry of Education show that only 0.4% of high-ability students received educational support in their school, taking into account that for the 2017–18 academic year, the percentage of the school population who are assessed as having high intellectual ability is between 10% and 20% [1].

In fact, identifying a student as having HA is a highly controversial issue, as it depends on one's definition of HA which, in turn, determines the manner in which they are identified and assessed [2]. Since students with HA constitute a heterogeneous group, there is no consensus as regards their defining traits. However, as previously mentioned, the cognitive functioning of these students shows characteristics of cognitive activity which can be explained by greater plasticity and efficiency. These assist in extensive attentional processes which facilitate the management of cognitive performance through working memory, flexibility, and inhibition [3].

Meanwhile, going beyond these cognitive characteristics, the most widely accepted models which seek to explain the characteristics of HA people consider creativity, as well as high levels of motivation and involvement in a task, as necessary factors which interact with elevated intelligence in these people. Similarly, factors relating to personality and context, such as family, education, and social environment, appear to influence the medium- and long-term development and consolidation of these abilities. These models define HA people as highly intelligent people, who are highly creative and have high levels of commitment to a task within the context of environmental factors, personality, and values. Moreover, they criticise limitation to solely cognitive aspects, maintaining that this concept should take other natural abilities into account, which go beyond the traditional definition of intelligence. In short, although cognitive abilities are an essential component in HA, other factors must also be considered along with personality and context variables which go beyond intelligence [4–8].

These considerations give rise to the question as to what the best way of assessing HA is. It is currently agreed that this assessment cannot be carried out exclusively using traditional instruments, such as an IQ test. On the contrary, the identification processes need to use multiple methods which consider various other constructs and factors [9].

On the other hand, over the past few years, the interest in creativity has led to the definition of certain characteristics which are shared by creative individuals. These include characteristics such as intellectual curiosity, high levels of commitment, the courage to be different, independent thought and action, a strong desire for self-fulfilment, a strong sense of themselves, high levels of self-confidence, openness to internal and external influences, attraction to complexity, high emotional involvement in their interests, and intrinsic motivation [10–14].

Csikszentmihalyi [15] compiles this list and identifies “complexity” as the key attribute when it comes to distinguishing a creative individual from their peers. He believes that there is no one exclusive type of creative personality, but rather traits which distinguish them from other people. One of these traits refers to the “Capacity for suffering vs pleasure,” which relates to the feeling of gratification from doing an activity which goes beyond external rewards, such that people do it for the enjoyment the activity itself provides [15]. This feeling is what Csikszentmihalyi [16] describes as autotelic experience, which is inherently rewarding and is a component of flow state with a highly positive emotional value. Flow state is a positive and optimal mental state during which people are highly motivated and absorbed in their activity. The optimal, or flow, experience may be produced when the information reaching your consciousness is congruent with the goals set. In this way, the activity flows effortlessly and there is no reason to question your own ability, while at the same time producing positive feedback and increasing self-confidence. The flow experience is important as it is vital to making the present moment more enjoyable, but also because it boosts self-confidence and promotes the development of personal skills [16].

Flow state is defined by means of the following eight components [16]: (1) Skill-challenge balance; this dimension aims to grasp the balance between your own abilities and the goal you wish to achieve. (2) Concentration on the task; this refers to how the capacity for attentional self-control manifests itself while the activity being evaluated is taking place. (3) and (4) Clear aims and Feedback; the goals to be achieved are unequivocally established and the gradual proximity to their achievement can be evaluated, in a reliable and precise manner, during the task. (5) Fusion of action and thought; indicates synchrony between thought and action. From a phenomenological perspective, this involves the perception that one is acting effortlessly, with a profound involvement which removes the worries and pressures of daily life from consciousness. (6) Feeling in control; this refers to the presence of a feeling of control over your own actions, or more precisely, it implies the absence of concern for losing control. (7) Loss of self-consciousness; indicates the degree to which the task becomes absorbent and central in that existential moment. This experience leads to a disregard for any other interest or concern which may be central to the person’s life at other times. (8) Distortion of time; this dimension refers to the altered perception of the passing of time while involved in the activity. The combination

of all of these elements creates a profound feeling of enjoyment, which rewards the person and which he calls autotelic experience.

There are significant differences as regards the intensity and frequency with which people experience flow state during an activity. People who experience high levels of flow are, generally, the most motivated and creative, in both work and leisure activities [17]. This relationship between flow state and creativity is the reason why flow theory has influenced the study of the relationship that exists between both variables and in different creative activities [18,19], such as music [20]. With regard to music, flow theory has influenced studies which seek to find new models of teaching-learning and creativity [21–23]. Certain studies in this line demonstrate significant direct correlations between flow state and creative musical tasks, such as composition [24–27].

Meanwhile, differences have also been found in the experience of flow which relate to personality traits of the five-factor model, such as neuroticism and conscientiousness. It has also been linked to self-control [28] and to the search for innovation and persistence [29]. However, it has not yet been linked to intelligence measured using Raven's SPM Plus or the Wiener Matrizen Test [30]. Despite this, results do exist which suggest that high-performing music students experience increased flow compared to moderately performing peers [31]. It has also been shown that talent impacts the frequency of the flow experience among adolescent musicians, such that talented musicians experience more flow than those with below-average abilities [32]. Flow state during musical performance has also been linked to a greater emotional intelligence [33]. Moreover, due to the relationship observed between flow state, in other activities different from music, with a locus of internal control [34], it is suggested that achieving flow state during musical performance may depend on emotional intelligence, but also be linked to the locus of internal control, since there is a connection between the latter and a rewarding experience [35].

Since the early days of flow theory, the idea has existed that there might be an autotelic personality, which would be those people who experience flow easily. The autotelic personality is characterised by a general curiosity and interest in life, persistence, and low levels of self-centredness [36]. Similarly, certain people may be incapable of experiencing flow, which could be related to their inability to concentrate and, as a result, their inability to enjoy themselves. In fact, attention disorders have now been linked to a wide variety of learning disabilities, which have in common the inability to moderate one's attention. This inability to moderate attention interferes with learning and likely rules out the possibility of experiencing flow, of learning and enjoying activities [16]. Another factor which could lead to the inability to experience flow relates to the excessive fear of ridicule. If a person is constantly worried about how others may perceive them, about making an impression or doing something inappropriate, they will also have difficulty experiencing flow. This issue relates to the dimension concerning loss of self-consciousness in flow theory. According to this aspect of flow state, the person forgets themselves, they disregard what is not essential and devote their attention to their activity [16]. Therefore, the excessive fear of ridicule and being too focused on oneself does not allow a person to moderate their attention either, such that these people do not enjoy themselves, they have difficulties learning, and opportunities for personality growth are reduced. Paying attention to what is happening leads to one becoming more involved, rather than being worried about oneself and, as a result, a greater openness to learning [16]. This is linked to recent neuroimaging studies [37,38] which showed that the flow experience is reflected in reduced neuronal activity in regions of the medial prefrontal cortex and the posterior cingulate cortex, regions which form part of what is called the "Default-Mode Network." This network shows increased activity when the mind is allowed to wander, and the person is focused on their own thoughts. However, when experiencing flow, this network is deactivated, which is consistent with the central component of flow state, according to which there would be a reduction in self-consciousness [39]. In fact, currently, when we talk about an attention deficit, we are referring to the difficulty staying focused on something and the difficulty disregarding stimulants which would be detrimental to the task. An attentive way of doing things would entail applying a proportion of our neuronal resources when executing a mental or motor operation, such as perceptive resources, working

memory, or alertness. Concentration is when this application of intellectual and affective resources is so significant that it does not leave any mental space to do other things. Moreover, if it is directed voluntarily, we call it an executive function. Normally, you can decide which type of mental operation you are going to begin or do attentively, but when there is an attention deficit, in other words, when a person has difficulty in directing or maintaining a mental operation, intrusive stimuli emerge which hijack the executive capacity of intelligence [40].

The above suggests possible relationships between flow state and the characteristics of gifted people, given that flow state is common in creative people. However, the way in which the different components of flow state relate to HA people could also be analysed.

The aim of this research is to analyse flow state in HA musicians. In addition, their scores on the flow measure that was used will be compared to those of non-HA musicians.

2. Materials and Methods

2.1. Participants

2.1.1. Total Sample Participants

The sample was obtained by means of snowball sampling. Members of three associations of HA people were given the opportunity to take part in this study and were asked to complete an online questionnaire. Regarding the HA identification criteria of these associations, according to data from the Spanish Association for the Exceptionally Gifted and Talented (*Asociación Española de Superdotados y con talento*, AEST) [41] for children, adolescents, and adults, parents detect the High Abilities of their children in 98% of cases. However, each Autonomous Community in Spain has its own protocol. For example, in Madrid, educational detection and care is the responsibility of the school, the Educational Psychopedagogical Guidance Teams (*Equipos de Orientación Educativa y Psicopedagógica*, EOEP) or Guidance Departments. In order to become a member of the AEST and benefit from its activities, certification of an individual's talent, high ability, or giftedness in the form of a psychological report is needed. Meanwhile, the Educational Enrichment Programme for Students with High Abilities (*Programa de Enriquecimiento Educativo para Alumnos con Altas Capacidades*, PEAC) [42] is aimed at the systematic development of the high abilities presented by a proportion of the school population, as an additional manifestation or materialisation of the principle of attention to diversity. Detection and evaluation of student participants is carried out at the request of their school and is done by the Educational Psychological Guidance Teams (Early Attention Teams, EAT, and General Teams, EOEP) or by the Educational Guidance Departments with the authorisation of the students' families and the collaboration of the schools. Another organisation which provides services for those with HA is Mensa [43], which accepts as members people whose IQ is within the top 2% of the general population and offers them the opportunity to participate in a wide range of activities. There is no distinct characteristic of Mensa members except for a high IQ. Members vary widely in terms of age, education, and professional activities.

In addition, students and teachers from different music conservatories and music schools, who have at least two years' experience of musical practice, were offered the chance to participate. The criteria used in order to categorise people as "high ability" were that they had been identified as such and that they belong to an association where these types of people come together and are recognised.

The total number of participants was 109, eight of whom were excluded because they were outliers or did not have at least two years of practical music experience. Thus, the definitive sample was $N = 101$. The participants' age range was between 14 and 65 years old (average 35.54 and $SD = 12.22$). Men accounted for 39.6% of the sample (average 37.05 and $SD = 12.99$), whilst women made up 60.4% (average 34.56 and $SD = 11.70$). All participants had more than four years of musical experience. Table 1 presents the data relating to the composition of the sample in terms of the categorical variables considered.

Table 1. Composition of the sample in terms of the categorical variables considered.

Variable	Categories	Percentages
Sex	Men	39.6%
	Women	60.4%
High Ability (HA)	YES	28.7%
	NO	71.3%
Instrument	Wind instruments	30.7%
	Piano	18.8%
	Singing	10.9%
	Plucked string instruments	10.9%
	Bowed string instruments	19.8%
	Other	8.9%
Style of music	Classical	64.4%
	Modern	33.7%
	Other	2%
Key situation chosen for responding to the questionnaire	Concert situation	57.4%
	Private situation	32.7%
	Informal situation	9.9%

2.1.2. Sample Participants with HA

The sample made up of only people with HA consisted of 29 people. The age group was between 18 and 57 years old ($m = 38.14$ and $SD = 11.234$). Twelve participants were men (41.4%; $m = 39.58$ and $SD = 12.788$) and 17 were women (58.6%; $m = 37.12$ and $SD = 10.283$). In order to be able to carry out comparisons between the different categories of variables, we divided the sample into two age groups: 18 to 34 years old ($N = 13$) and 35 to 57 years old ($N = 16$). We were unable to create a younger age group as only three participants were under 25 years old. We categorised years of study into three groups: 4 to 8 years ($N = 8$), 10 to 20 years ($N = 12$), and 21 years or more ($N = 9$). Musical styles were categorised into classical ($N = 15$) and modern ($N = 13$), while one participant was categorised as “other.” Finally, the key situations chosen were concert situation ($N = 14$) and private situation ($N = 13$), while two participants chose an informal situation (see Table 2).

Table 2. Composition of the sample of people with HA in terms of the categorical variables considered.

Variable	Categories	Percentages
Age	Up to 34	44.8%
	35 and over	55.2%
Years of study	Up to 9 years	27.6%
	From 10 to 20 years	41.4%
	21 years or more	31%
Style of music	Classical	51.7%
	Modern	44.8%
	Other	3.4%
Key situation chosen for responding to the questionnaire	Concert situation	48.3%
	Private situation	44.8%
	Informal situation	6.9%

2.2. Procedure

Recipients were informed that participation was anonymous and voluntary. They were to complete a form, created using Google Forms, which included the “informed consent” page to be completed by the parents or guardians of underage participants. This informed consent page for underage participants was submitted using the IT platform [44], which sent an email to the researchers

each time authorisation was received. The form completed by the participants also included the “Flow State for Musical Performers” (*Estado de Fluidez para Intérpretes Musicales*—EFIM) scale. Furthermore, and as seen in Table 1, it collected information regarding the participants’ sex, how many years of practical music experience they had, the style of music, their instrument, the key situation chosen for responding to the questionnaire, and regarding their identification as having high ability.

2.3. Instrument

The “Flow State for Musical Performers” (*Estado de Fluidez para Intérpretes Musicales*—EFIM) scale [45] is the Spanish adaptation of the Flow State Scale-2 (FSS-2) for the musician population [46,47]. The FSS-2 was designed to evaluate the experience of flow in the context of physical activity, but it has also been used to evaluate flow state in other activities, such as musical performance. The EFIM scale presents good internal consistency and discrimination as well as good indices of fit for two structural models. It is considered a verified tool for evaluating flow state in musicians and for investigating and measuring this variable, the (EFIM) scale. It is composed of a questionnaire with 24 items which measure flow state. It consists of six scales, each of which has four elements and is conceptually different: Action-awareness merging (it will be *merging*); Total concentration on the task at hand (*concentration*); Sense of control (*control*); Loss of self-consciousness (*consciousness*); Transformation of time (*time*); and Autotelic experience (*autotelic*). In order to evaluate the degree of agreement with the text relating to each element, a Likert scale from 0 to 10 is used, where 0 means you totally disagree and 10 you totally agree. The scores for each of the 6 scales can be obtained separately, as well as the *overall flow* state. All of the scales, including *overall flow* state, show good internal consistency and discrimination [45]. When answering the section relating to the EFIM scale, participants have to choose a situation to use as a reference. In other words, they could choose either a concert, a private situation (playing at home or in a classroom, studio, etc.), or an informal situation (spontaneous, with friends, etc.), as seen in Table 1. As the authors of the scale indicate, the ideal time for providing answers is at the end of the situation or shortly thereafter [45].

2.4. Statistical Analysis

The statistical analyses were carried out using the SPSS (V24, IBM Corporation, NY, USA) programme for Windows and G*Power 3.1.9.2. [48,49]. In order to verify whether a relationship exists between the independent variables (age, sex, style of music or years studying the instrument) and the experience of flow, multiple linear regression analyses were carried out in a step-by-step manner on both the total sample and the sample of people with HA. To compare groups within the total sample, the Student’s *t* test was carried out and Levene’s test of variance equality was taken into account, fulfilling the criterion of homoscedasticity in all comparisons, except those highlighted (a) in Tables 4–6. The effect size and statistical power of the comparisons were also calculated. Comparisons were also carried out exclusively within the sample of people with HA. As there were only 29 participants, we carried out nonparametric analyses: the Mann–Whitney test for the two independent samples and the Kruskal–Wallis test for *K* independent samples.

3. Results

3.1. Regression Analysis

Regression analyses of the total sample show that the “years studying the instrument” variable is associated with the dependent variables: *overall flow* ($R^2 = 0.068$; $F = 7.277$; $p = 0.008$); *merging* ($R^2 = 0.078$; $F = 8.373$; $p = 0.005$); *concentration* ($R^2 = 0.049$; $F = 5.098$; $p = 0.026$); *control* ($R^2 = 0.061$; $F = 6.487$; $p = 0.012$); and *autotelic* ($R^2 = 0.039$; $F = 4.027$; $p = 0.047$). The rest of the predictor variables are excluded from the model. Regression analyses with the *consciousness* and *time* dimensions show that none of the variables are associated with the dependent variable. Regression analyses of people with HA show that none of the variables are associated with *overall flow* or its dimensions, with the exception of *merging*, which is linked to age ($R^2 = 0.145$; $F = 5.585$; $p = 0.041$).

3.2. Student's *t* Test of the Total Sample

The Student's *t* test, for comparing the averages obtained from the two groups (HA and non-HA) in each of the scales, showed that there were no significant statistical differences in almost all of the scales. The exception was *consciousness*, which presented significant statistical differences between the averages obtained from the two groups ($t = 3.20$; d.f. = 99; $p < 0.01$), with a moderately large effect size ($d = 0.70$) [50] and good statistical power ($1-\beta = 0.89$) [51]. In terms of effect size, the *concentration*, *time*, and *autotelic* scales obtained a value above the cutoff point of 0.20 [50], which equates to a small effect, and the general scale for *overall flow* obtained a value above 0.30, also small, but something to consider. In regard to statistical power, these same scales and *overall flow* show a low power, with values between 0.18 and 0.32 (see Table 3).

The Student's *t* test that was used for the following comparisons of classical or modern music style, sex, and concert or private situation show nonsignificant differences in all scales. The effect size obtained values between 0.01 and 0.41, and the statistical power between 0.05 and 0.46. The *consciousness* scale for the comparison, according to the situation chosen to respond to the questionnaire (concert or private), shows a median effect size value ($d = 0.41$) with a statistical power of $1-\beta = 0.46$ (see Tables 4–6).

Table 3. Mean scores and standard deviations obtained by high-ability (HA) people ($n = 29$) and participants from the general population ($n = 72$) in the six scales and the scale of *overall flow*. The value of the *t* statistic, the value *p*, the effect size, and the statistical power of the comparisons are all included. In all cases, the value of the degrees of freedom was: d.f. = 99.

Variable	HA	Mean	Standard Deviation	<i>t</i>	<i>p</i>	<i>d</i>	1- β
<i>merging</i>	Yes	27.03	8.23	0.06	0.952	0.01	0.05
	No	26.93	7.75				
<i>concentration</i>	Yes	32.34	6.64	1.06	0.292	0.23	0.18
	No	30.74	7.00				
<i>control</i>	Yes	30.38	7.70	0.41	0.681	0.09	0.07
	No	29.67	7.91				
<i>consciousness</i>	Yes	29.62	12.24	3.20	0.002 **	0.70	0.89
	No	21.00	12.24				
<i>time</i>	Yes	21.45	12.88	−1.03	0.303	0.23	0.18
	No	23.94	10.11				
<i>autotelic</i>	Yes	35.00	5.74	1.22	0.222	0.27	0.23
	No	33.15	7.23				
<i>overall flow</i>	Yes	175.83	31.93	1.51	0.133	0.33	0.32
	No	165.43	30.97				

Note: *t* = Student's *t* test; *d* = effect size; $1-\beta$ = statistical power; ** $p < 0.01$.

Table 4. Mean scores and standard deviations according to classical ($n = 65$) and modern ($n = 34$) musical style in the six scales and the *overall flow* scale. The value of the *t* statistic, the value *p*, the effect size, and the statistical power of all the comparisons are included. In all cases, the value of the degrees of freedom was d.f. = 97.

Variable	Style	Mean	Standard Deviation	<i>t</i>	<i>p</i>	<i>d</i>	1- β
<i>merging</i>	Classical	26.98	7.598	0.043	0.965	0.01	0.05
	Modern	26.91	8.508				
<i>concentration</i>	Classical	31.65	6.318	0.725	0.470	0.15	0.11
	Modern	30.59	7.882				
<i>Control</i>	Classical	30.38	7.361	0.814	0.418	0.17	0.13
	Modern	29.03	8.758				
<i>consciousness</i>	Classical	23.02	12.260	−0.384	0.702	0.08	0.07
	Modern	24.06	13.935				
<i>Time</i>	Classical	23.38	11.265	0.089	0.930	0.02	0.05
	Modern	23.18	10.800				
<i>autotelic</i>	Classical	34.40	6.033	1.263 ^a	0.210	0.27	0.24
	Modern	32.59	8.027				
<i>overall flow</i>	Classical	169.82	28.779	0.520	0.604	0.11	0.08
	Modern	166.35	36.065				

Note: *t* = Student's *t* test; *d* = effect size; $1-\beta$ = statistical power. ^a Levene's test, $p = 0.031$.

Table 5. Mean scores and standard deviation according to sex, women (n = 61) and men (n = 40), in the six scales and *overall flow* scale. The value of the t statistic, the value p, the effect size, and the statistical power of all the comparisons are included. In all cases, the value of the degrees of freedom was d.f. = 99.

Variable	Sex	Mean	Standard Deviation	t	p	d	1-β
merging	Man	25.93	7.816	−1.075	0.285	0.22	0.19
	Woman	27.64	7.855				
concentration	Man	31.95	6.300	0.886	0.378	0.18	0.14
	Woman	30.70	7.279				
control	Man	30.63	6.845	0.783	0.435	0.16	0.12
	Woman	29.38	8.413				
consciousness	Man	25.40	12.995	1.227	0.223	0.25	0.23
	Woman	22.21	12.607				
time	Man	22.55	11.589	−0.501	0.617	0.10	0.08
	Woman	23.67	10.612				
autotelic	Man	34.75	6.025	1.270 ^a	0.207	0.26	0.24
	Woman	32.98	7.315				
overall flow	Man	171.20	29.015	0.719	0.474	0.15	0.11
	Woman	166.59	33.046				

Note: t = Student's t test; d = effect size; 1-β = statistical power. ^a Levene's test, p = 0.035.

Table 6. Mean scores and standard deviations according to the situation chosen to respond to the questionnaire, concert situation (n = 58) or private situation (n = 33), in the six scales and *overall flow* scale. The value of the t statistic, the value p, the effect size, and the statistical power of all the comparisons are included. In all cases, the value of the degrees of freedom was d.f. = 89.

Variable	Situation	Mean	Standard Deviation	t	p	d	1-β
merging	Concert	27.19	7.270	0.146	0.884	0.03	0.05
	Individual	26.94	8.782				
concentration	Concert	31.48	6.533	0.358	0.721	0.08	0.06
	Individual	30.94	7.648				
control	Concert	30.67	7.538	0.980	0.330	0.21	0.16
	Individual	29.03	7.939				
consciousness	Concert	22.05	12.314	−1.885	0.063	0.41	0.46
	Individual	27.21	12.973				
time	Concert	22.74	12.222	−0.568 ^a	0.571	0.12	0.09
	Individual	24.12	8.880				
autotelic	Concert	33.88	7.121	0.082	0.935	0.02	0.05
	Individual	33.76	6.340				
overall flow	Concert	168.02	29.698	−0.584	0.561	0.13	0.09
	Individual	172.00	33.957				

Note: t = Student's t test; d = effect size; 1-β = statistical power. ^a Levene's test, p = 0.014.

3.3. Nonparametric Tests on the HA Sample

The results of comparisons carried out exclusively on the sample of people with HA did not show any significant differences between the different variable categories according to sex, age, years of study, style of music, and the key situation chosen.

4. Discussion

Current approaches towards HA people show that the identification of these people based solely on cognitive aspects, and more specifically on their IQ score, involves a risk of obtaining both “false positive” and “false negative” results. Therefore, diagnostic specialists view IQ as one of several indicators and consider other quantitative and qualitative indicators, such as creativity, learning style, evolutionary development, and other characteristics of HA individuals. Meanwhile, flow state has been linked to the creative personality, such that creative people share the pleasure of enjoying their activity, although they differ from one another in many ways. This investigation studied the possible relationship between HA people who dedicate themselves to music or the study of music and the flow state that occurs whilst they are engaged in musical activities, such as playing at a concert or an

informal event. The EFIM scale was used as a measure of flow state, and the scores obtained from two groups were compared: people recognised as HA and people from the general population.

The results of the regression analyses suggest that, within the general population, “years of study” is linked to the general flow experience and to the *merging*, *concentration*, *control*, and *autotelic* dimensions but not to *consciousness* and *time*. The “years of study” variable would predict between 4% and 8% of the variability according to the dimension. Meanwhile, in the sample of people with HA, only the *merging* dimension would be associated with age, meaning that age would predict at 15% the variability in the experience of this dimension. In other words, the older you get, the more you experience a fusion of action and thought. On the one hand, these results may serve as a reference for the initiation of studies which look more deeply at these relationships.

On the other hand, they suggest that the results of comparisons between the general population and those with HA are more consistent, given that the *consciousness* dimension, which shows significant statistical differences, with people with HA experiencing the biggest loss of self-consciousness, is not linked to any of the predictor variables introduced to the analysis in any of the samples, neither in the general population nor those with HA.

In regard to the comparisons of the total participant sample, the results show that there is no significant statistical difference in the *overall flow* scale whilst engaged in a musical activity between HA people and the general population. However, this difference obtained a size effect value of 0.33, above the cutoff point of 0.20 [50]. This is a relatively small value, but it reflects that there could be differences between the two groups which were not detected due to the sample size and, in fact, it may be that HA people do experience a greater level of flow during musical performance than people from the general population.

This result appears to be consistent with studies which have not found a link between flow state and intelligence, measured using a fluid intelligence test, such as Raven’s SPM Plus or the Wiener Matrizen Test [30]. On the other hand, it is a result which is not congruent with studies which have found that high-performing music students experience greater flow in comparison with their moderately performing peers [31], or those which show that talented musicians experience greater flow than those with below-average abilities [32]. However, information about these specific aspects of HA and musical talent was not collected in this study, and, therefore, it cannot be deduced that the people diagnosed as HA who participated in this study, although they are musical performers, are people who stand out or are particularly devoted to music.

Meanwhile, although differences between the two groups in the *overall flow* scale and the majority of the subscales were not found, the *consciousness* scale shows that, on the one hand, there are significant statistical differences ($t = 3.20$; $p < 0.01$) and that, on the other hand, the effect size and the statistical power speak to the robustness of the comparison ($d = 0.70$; $1-\beta = 0.89$). This scale indicates the degree to which a task is absorbing and central in a specific moment. HA people manifest a greater loss of self-consciousness when engaged in playing their instrument than those who are not HA. As expressed in the statement from the questionnaire, people who score higher on this scale are less worried about what others may be thinking of them or how they are appearing to others. This result suggests that HA people may exhibit a characteristic related to the fear of ridicule. In other words, one of the reasons for the inability to experience flow is related to excessive fear of ridicule and being too self-centred, which prevents a person from being able to moderate their attention. This is linked to lack of enjoyment, but also to the experience of learning difficulties. Conversely, instead of being concerned with themselves, focusing attention on what is happening leads to greater involvement and, consequently, to a greater openness to learning [16]. Recent neuroimaging studies [37,38] show that the flow experience is reflected in the reduction of neuronal activity in parts of the brain known as the “Default-Mode Network,” which is consistent with the *consciousness* subscale [39]. This will also be linked to executive intelligence capacity for directing or maintaining a mental and/or motor activity without intrusive stimuli appearing during it [40]. This characteristic, i.e., the *consciousness* of HA people, may be related to the cognitive activity shown by HA students and which contributes

to attentional processes which facilitate the management of cognitive performance through working memory, flexibility, and inhibition [3].

Taking into account these relationships between fear of ridicule, enjoyment, attention, and learning, the results of this study show that HA people obtain a higher average, if we compare the averages of the *concentration* and *autotelic* subscales, although there are no significant statistical differences in the comparisons between the two groups. In fact, the *concentration*, *autotelic*, and *overall flow* scales obtain an effect size above the cutoff point of 0.20, which would equate to a small effect and a low statistical power, between 0.18 and 0.32. These results suggest that, due to the sample size, differences between the two groups are not being detected and that, in reality, differences in concentration, enjoyment of the experience, and *overall flow* state could exist.

Meanwhile, the *consciousness* dimension may be related to aspects of the creative personality which we have previously mentioned, such as the courage to be different, independent thought and action, and high levels of self-confidence [10–14].

The remainder of the comparisons carried out between the groups classical or modern style of music, sex, and concert or private situation did not shown significant differences in any of the scales. Meanwhile, as in the case of the comparisons between those diagnosed as HA and those of average or below-average capacity, the possibility of an error in the detection of differences exists for the cases of effect size above the cutoff point of 0.20 and with an insufficient statistical power due to the sample size. The *consciousness* scale stands out in particular, in the comparison according to the situation chosen by the participant to respond to the questionnaire (concert or private), which presents an effect size of 0.41 and a statistical power of 0.46.

It should be noted that the “informal” situation was not compared with other situations due to the fact that very few participants selected this option. The “instrument” variable was not considered either, due to the number of musicians being widely distributed among different instruments and there being few cases for each category.

Finally, the results of the comparisons with the sample of people with HA among the different categories of variables according to sex, age, years of study, style of music, and key situation chosen show, on the one hand, that no singular category of variables analysed seems to influence the general flow state, nor the flow state dimensions of participants, more than the others. On the other hand, they give more consistency to the results obtained through comparisons between the group of people with HA and the general population, given that the group of people with HA is homogeneous in these variables.

5. Conclusions

The results of this study show that there are differences between people diagnosed as HA and those who are not in one of the dimensions of the flow state. The *consciousness* scale shows that HA people achieve a greater loss of self-consciousness than those who are not, to a statistically significant extent. This difference is notable in the experience of not being concerned about what others may be thinking of you, or the disregard for how one appears to others in a particular moment, in this case, during musical performance. This characteristic, which forms part of the flow state experience, may be linked to aspects of the creative personality which we have previously mentioned, such as the courage to be different, independent thought and action, and high levels of self-confidence. The results thus suggest a relationship between HA people, the experience of flow, specifically in the experience of loss of self-consciousness, and traits of the creative personality.

The results also suggest that HA people may have less fear of ridicule and be less self-centred, which would allow them to better moderate their attention, enjoy themselves more while learning more and, therefore, to learn better.

The fact that this study covered a very broad sample in terms of age and the different ways in which participants relate to the activity of making music means that it provides a perspective of the experience of flow state which is less likely to be influenced by other variables. These variables

may have had an influence if the study had focused exclusively on professional or high-performance musicians given that there are other variables in these groups, such as the number of hours spent practising or the age at which they began to study, which would contribute to flow state. A less homogenous but more varied sample is thus available which neutralises the effects of these factors.

In addition to this, the low statistical power of some of the comparisons, while detecting effect sizes above the cutoff point of 0.20, suggests that the probability of detecting differences in some of the subscales, such as concentration and autotelic, and in the *overall flow* state, could increase if the size of the sample was increased. It is advisable to take into account—and this may be one of the limitations of this study—that categorising people as HA or not was dependent on whether they had been diagnosed as such or not. There therefore may be people who are HA but not recognised as such in the non-HA group. Another limitation of this study is that it was not possible to supervise exactly when the scale was completed, taking into account that the appropriate time to fill it out was considered to be straight after finishing the activity being assessed for flow state [45].

As stated in the introduction, flow state during musical performance may be related to a greater emotional intelligence [33]. Beyond these results, it suggests that achieving flow state during musical performance may depend on emotional intelligence but may be also linked to the locus of internal control, since there is a connection between the latter and a rewarding experience [35]. The results of this study, which show that people with HA have a greater experience of flow in the loss of self-consciousness dimension and that increasing the size of the sample may incur obtaining significant statistical differences in other dimensions or in the *overall flow*, encourage one to analyse more deeply the relationships between flow, the locus of control, and people with HA, but also other characteristics that are linked to the experience of flow, such as self-control, persistence, or the search for innovation [28,29].

In conclusion, the results of this investigation suggest that the relationship between HA people and flow state may be a worthwhile line of research. Increasing the sample size could be a first step, as well as studying flow experience in relation to other activities, not just music, in order to see which relationships are established between the different activities and components of flow. This would allow us to ascertain whether HA people, independent of the activity they are engaged in, present a distinctive pattern as regards flow state, such as a greater loss of self-consciousness, which may be directly related to better learning.

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