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Fear and Disgust Toward Insect Among Psychiatric Disorder Patients and Healthy People

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The present study investigates the prevalence of fear and disgust toward insects among people with mental illness. A cross-sectional survey using a newly designed arthropods survey was distributed to targeted population using both google forms and face-to-face recruitment. Out of 175 respondents in the study, 41% are diagnosed with any psychiatric disorder while 59% are healthy people. There are significant differences between fear and disgust on insects among healthy people and people with mental illness. Wasp (87.3%), weaver ant (44.4%), and sago larvae (31.3%) were feared by psychiatric patients. Sago larvae was the most disgusting insect by people with mental illness (51.5%) while healthy people were more disgusted with caterpillars (53.4%). The fear and disgust of different insects vary with gender and employment among the two groups; female from both groups were more disgusted with head lice than male while employed healthy adults feared head lice. This study provides new knowledge on the existence of fear and disgust of arthropods among people with mental illness. Since such people have high comorbidity with other psychiatric disorders, this finding provides new insights on the prevalence of fear and disgust toward insects among the patients for early intervention by health professionals.

Keywords: Arthropods; cross-sectional study; mental illness; phobia

I. INTRODUCTION

Fear and disgust are two important basic emotions that govern human reactions to stimuli or objects and situations. In animal or insect literature, studies of fear of animals have been conducted abundantly over the last 50 years (Kostuch, 2022), while studies of disgust toward the animal or insects only showed a small increasing trend although it is still understudied (McNally, 2002). Intensive fear of certain animal or insect can lead to specific phobia whereby an individual experiences irrational fear and avoidance toward this animal and this phobia may significantly affect social and occupational functioning (American Psychiatric Association, 1994). By drawing to concept of fear and disgust, a few authors were able to show relationship between fear and disgust with phobia or anxiety and obsessive-compulsive disorder (Olatunji *et. al.,* 2004; Thorpe & Salkovskis, 1998). A correlation between disgust with animal phobia as well as blood injury phobia (Tolin *et. al.,* 1997; Frynta *et al.,* 2021) has been reported. A study on visual event–related potential (VERP) indices (P1 and P250/s) with a simple visual search task, indicated that anxiety correlated with fear and disgust. They also found that there is different arousal activity in associative visual areas induced by disgust and fear that intensified the anxiety. Similar with other study finding, they also concluded that disgust correlated with fear and disgust role overlaps with fear in anxiety situation (Krusemark & Li,

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2011). Mulkens and colleagues found that spider phobia respondents have higher feeling of disgust than non-spider phobia respondents (Mulkens *et al.,* 1996).

Drawing on an extensive range of literature, it is documented that animals produce negative emotions to human beings. The majority of the most frightening species are large vertebrates (such as carnivorans, ungulates, sharks, and crocodiles), while snakes and arachnids are representative of smaller fear-inspiring vertebrates and invertebrates, respectively (Staňková *et al.,* 2021). Among these animals, fear of snakes has been documented to trigger snake phobia with a prevalence of 2-3% of the Western population (Polák *et. al.,* 2020; Polák *et al.,* 2016). Similarly, fear of insects such as spiders, cockroaches, and wasps has also been investigated; a specific questionnaire has been developed to identify and manage this fear (Botella *et. al.,* 2011; Frynta *et. al.,* 2021, Kritikos *et. al.,* 2019; Zsido *et al.,* 2022) as well as to differentiate between fear among phobic and non-phobic people toward insects (Gerdes *et. al.,* 2009; Mulkens *et. al.,* 1996; Webb & Davey, 1992). A study using university students as respondents indicated that 6.5% of university students were classified as having extreme phobia toward insects with the female students having higher phobia prevalence with mean score of 78.9 than male mean student of 42 (Ebrahimifar *et al.,* 2019). About 55% university students believed insects are not injurious and 62% of them believed that they are not damaging to humankind (Hayati & Minaei, 2015). The researchers concluded that phobia toward insects is not due to injurious or effect of insects but due to psychological emotion and perception toward insects (Hayati & Minaei, 2015). In another study, 4.5% of elementary school students had severe phobia toward insects (Shahriari-Namadi *et al.,* 2018). In our recent study using an arthropods survey, we found that half of the university students fear scorpions, wasp, centipede, bee, blister beetle and cockroach (Azil *et al.,* 2021). In addition, we also found cockroaches were reported as fearful and disgusting by university students in Malaysia (Azil *et al.,* 2021). In conclusion, the studies have shown the existence of fear toward arthropods or small insects that vary by the size of insects, gender, age, and different countries.

Stork (2018) stated that out of 5.5 million species of insects, and terrestrial arthropods, only 1 million species of insects has been named while the rest is yet to be discovered by their type and species (Stork, 2018). Furthermore, it still unknown whether these small dangerous or harmless insects, and terrestrial arthropods are able to induce fear or disgust in human being which justifies the need for further studies. At the time of writing, information about disgust toward insects is still scarce among both healthy and psychiatric populations. It is also important to determine whether the disgust caused by insect is also induced by fear toward the insect which may vary between age, sex, cultural background, and geographic location of respondents (Armfield, 2007). Few literatures have documented that bite of small insects induce Lyme disease, skin problem or other rare psychiatric disorder such Delusional Parasitosis (Sno, 2012; Suh & Jay, 2018). Psychiatric populations, however, differ from healthy adults in terms of their apprehension to insects and their infestation. Information on fear and disgust of arthropods and their types exist among people with mental illness remains limited. People with mental illness have high comorbidity with other psychiatric disorders (Eaton *et al.,* 2018), this can include psychotic delusions of insect attacks and infestations (Weinstein & Slaney, 2008). It is crucial to identify this fear and disgust toward insects so that early treatment of fear and disgust can be provided to lower the risk of other disorders (Eaton *et al.,* 2018). Information and innovations based on knowledge on fear and disgust (Woody & Teachman, 2000) is crucial to design an effective intervention that can help overcome fear and disgust toward insects. Thus, the present study investigates the type of arthropods that elicit fear and disgust among people with mental illness. We also would like to determine whether differences exist between healthy people and psychiatric patients. We also like to determine predictors of this fear and disgust among people with mental illness. Based on our literature review, we hypothesise that there are significant differences between healthy individuals and people with psychiatric disorder in fear and disgust toward arthropods.

II. MATERIALS AND METHODS

This is a cross-sectional study, using convenience sampling conducted by recruiting healthy people who lived in Klang Valley, Putrajaya and Bangi, Malaysia. Psychiatric patients who attended psychiatric clinic in Hospital Tuanku Muhriz

Centre were recruited in this study. Patient must be diagnosed by psychiatrist using DSM-IV and documented in patient record. They also must be stable, are ongoing follow-up with psychiatric clinic and did not have any neurological disorder as well as consented to participate in the study. Healthy respondents were included if they were aged 18 and above and excluded if they were uncooperative and/or unable to communicate well in English and Malay. Participants who gave consent were asked to complete the demographic survey and Malay arthropods survey. When a patient struggles to identify the arachnids, the researcher assistant will help by showing them a photograph. This study was approved by the Human Research Ethics Committee of Universiti Kebangsaan Malaysia (Ethics Committee/Irb Ref No: UKM PPI/111/8/JEP-2019-701).

A. Measures

Malay arthropods survey was created and tested among university students and was used in this study. This survey consists of a list of insects and other arthropods found in Malaysia. The survey items were derived and modified from the fear survey schedule (Geer, 1965) and literature reviews on fear of insects (Lockwood, 2013; Marks 1987; Wolpe & Lang, 1974) as well as expert information from entomologists, and psychology specialists and students. It has 46 arthropod items where the respondent has to rate (yes/no) whether they feel fear or disgust with the arthropods. In addition, we also provide pictures related to insect in order to confirm that they recognise the insect/arthropod. Content validity of this newly created survey questionnaire in Malay language was performed by entomologist and psychology experts. We also checked the reliability to ensure the accuracy of tems and it was found that this questionnaire is reliable as acquired from the Cronbach alpha value (0.9).

A. Statistical Methods

Data were inspected for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests prior to analyses using SPSS Version 22. To detect differences between the psychiatric and normal respondent's groups, chi-square tests were performed for nominal (e.g., gender, marital, employment status and arthropods type) and ordinal (i.e., age) variables; and or Mann-Whitney *U* tests (nonparametric equivalence) for nominal variables (arthropods types). Further analyses of fear and disgusted types of arthropods were conducted individually for each group of psychiatric patient and normal adults. The two-tailed *p*-value was used in this study and the level of statistical significance was set at $p < 0.05$ for all tests.

III. RESULTS

A total of 175 respondents participated in this study (Table 1). Out of 175, 41% have been diagnosed as having a psychiatric disorder while 59% are healthy people. About 93% from community have experienced being stung by any form of insect while 72% with mental illness have been stung by insects. Both groups of participants live in urban areas with 68% from community and 72% people with mental illness living in urban areas.

Table 1. Demographic information of the respondents

Demographic Data	**Community**	**Psychiatry**	**P value**
Age			
≤30 years	50	36	*p*=
>30 years	53	36	0.85
Gender			
Male	46	32	*p*>0.95
Female	57	40	
Marital status			
Single	51	17	*p* = 0.001
Married	48	49	
Others	4	6	
Employment status			
Unemployed	10	14	*p* = 0.92
Employed	72	37	
Studying	21	21	
Living area			
Urban	70	52	
Semi-urban	19	16	*p* =
village	14	14	0.23

Wasp, weaver ant and sago worm were indicated by psychiatric patient as fearful insect compared with healthy people (Figure 1). In comparison to healthy people, psychiatric patients rated sago larvae as the most disgusting

insect (Figure 2). Normal people were more disgusted with caterpillars, centipedes, fireflies, and giant water-bugs compared to psychiatric patient (Figure 2).

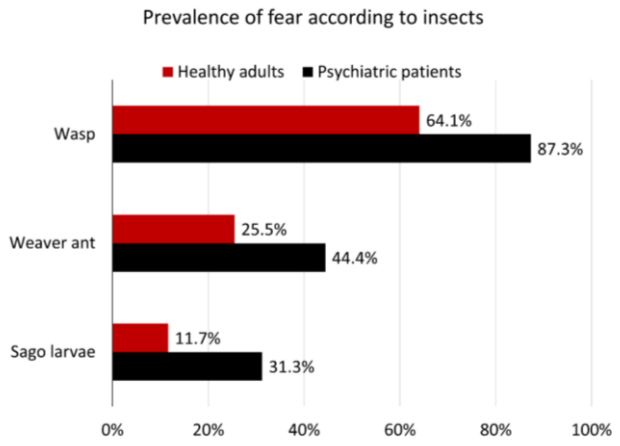

Figure 1. The prevalence of fear according to insects

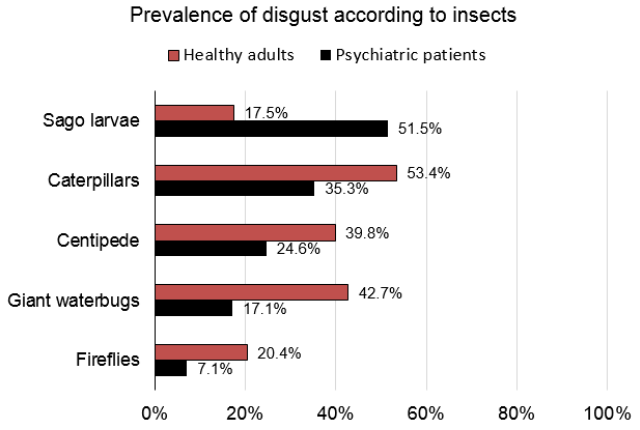

Figure 2. The prevalence of disgust according to insects

There is significant difference between gender on fear toward insects (Figure 3). The more fearful insect between gender were centipede. Female were more fearful and disgusted with nine arthropods compared to male with the largest differences in head lice, spiders, crickets, and potter wasps. Further analysis of gender for each group indicated that female psychiatric patients were more disgusted of head lice ($X^2 = 5.074$, p-value = 0.024) while normal female adults were disgusted with head lice ($X^2 = 9.186$, p-value = 0.002), giant water-bugs ($X^2 = 9.396$, p-value = 0.002) and flies ($X^2 = 7.26$, p-value = 0.007). The total percentage of women fearing head lice was about 26.1% (psychiatric patients) and 37.8 % (normal adults).

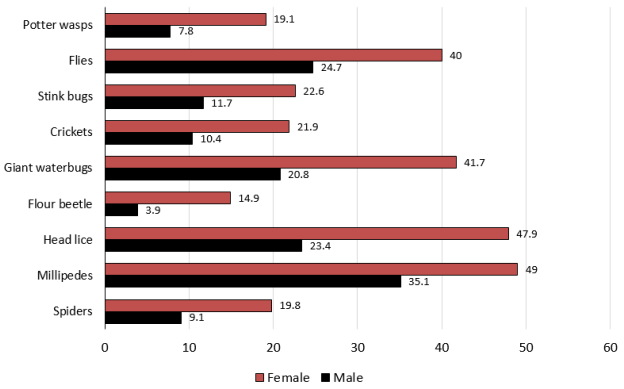

Figure 3. Percentage of dear to insect by gender

About 72% of female from both groups feared centipede. More than 60% of female psychiatric patients also fear bees and blister beetles. Three arthropods namely spiders, centipede, and sago larvae were significantly feared by both groups of females compared to male (Table 2). Female psychiatric patients also feared more of bees, blister beetles, cockroaches, beetles, and giant water-bugs compared with male psychiatric patients (Table 2). Healthy female adults also fear fire ants, weaver ants, ladybirds, scabies mites and scrub typhus mites with significant differences with their male counterparts.

Table 2. Gender fear against insect among psychiatric patients and healthy adults

	Psychiatric patients		**Healthy adults**	
Insect	**X^2**	***p*-value**	**X^2**	***p*-value**
Spiders	5.259	**0.022**	5.136	**0.023**
Bees	12.106	**0.001**	3.287	0.070
Blister beetles	13.512	**0.000**	1.377	0.241
Fire ants	1.365	0.243	4.133	**0.042**
Weaver ants	1.125	0.289	6.834	**0.009**
Cockroaches	11.899	**0.001**	0.963	0.326
Centipede	7.852	**0.005**	4.030	**0.045**
Beetles	4.813	**0.028**	0.576	0.448
Sago larvae	4.156	**0.041**	4.307	**0.038**
Giant waterbugs	5.366	**0.021**	0.159	0.690
Ladybird	3.706	0.054	5.145	**0.023**
Scabies mites	3.621	0.057	6.107	**0.013**
Scrub typus mites	3.075	0.079	5.670	**0.017**

No difference in fear of insect was found in terms of working status among psychiatric patients. Among normal people, differences of working status were significant for head lice (X^2 = 7.440, *p*-value = 0.024). People who are employed and student were fearful of head lice. Unemployed psychiatric person was more disgusted with stink bugs (X^2 = 9.182, *p*-value = 0.01), while normal employed adult was more disgusted with earwigs (X^2 = 6.825, *p*-value = 0.033). Table 3 shows status of disgust among normal adults.

Table 3. Status disgust of insect among normal adults

	Normal adults		**Ratio (Unemployed/ employed/ student)**
Insect	**X^2**	***p*-value**	
Black house ants	10.435	0.005	3:5:6
House dust mites	11.736	0.003	6:14:6
Head lice	7.713	0.021	5:21:12
Stink bugs	8.283	0.016	4:9:6
Ticks	7.171	0.028	4:11:7
Scabies mites	6.517	0.038	5:19:10
Scrub typhus mites	12.029	0.002	6:15:9
Sand flies	9.927	0.007	5:11:6

We also found no difference in fear of arthropods with age range for psychiatric group. Younger psychiatric patients were disgusted with fire ant (*p*-value = 0.035) and earwigs (*p*-value = 0.039). In contrast, younger normal adults feared 25 arthropods and were disgusted with 13 arthropods compared with older adults (*p*-values < 0.05).

IV. DISCUSSION

In the present study, people with psychiatric disorders rated fear and disgust differently toward insects and this was significantly different from normal healthy people. Feeling fear toward wasp, weaver ant and sago larvae was evident among people with mental illness compared to healthy people. Meanwhile, caterpillars, centipedes, fireflies, and giant water bugs as well as sago larvae were rated as fearful by healthy people which was supported by our previous finding. In addition, sago larvae were stated as the most disgusting arthropods by people with mental illness than by healthy people. A possible explanation for this finding is sago larvae are found on trunks of palm trees causing disease (signed by rotting) and eventually death to the host plant. This imposes a 'label' of toxicity on the insect which lead to it being avoided by humans (Rozin *et al.,* 1990). To protect from disease, caused by some animal or insect, disgust mediates this fear through avoidance behaviour (Webb & Davey 1992). Although sago larvae are used as nutritious food in some countries, (Chinarak *et. al.,* 2020; Köhler *et al.,* 2020) due to high nutrient component, disgust feeling was also induced by its ugly and rusty appearance. Gerdes and team found that university students rated high fear toward spiders and high disgust for beetles (Gerdes *et al.,* 2009). However, the university students indicated their dangerousness perception toward spiders, bees, and wasps which may provide an explanation for our findings (Gerdes *et al.,* 2009). Curtis and Biran (2001) stated that although larvae and earthworms are not dangerous to human health, they induced fear due to the following characteristics: long, wriggly, and/or slimy and resembling intestinal helminths (Curtis & Biran, 2001). Fear of caterpillars, centipedes, and giant water bugs are also associated with the insects' ability to bite human beings that produce painful sensations as well as produce toxins when the insect was attacked by predatory animals or other insects. These toxins may generate allergy reactions and produce uncomfortable sensations in human beings.

Surprisingly we did not find maggots were highly disgusting as we found in our earlier studies (Azil *et al.,* 2021). Maggots were rated disgusting among people from India and United Kingdom (Curtis & Biran, 2001). Whilst flies were also rated as disgusting by people from India and the Netherlands (Curtis & Biran, 2001). In another study, they found compared to wasp, lice are more disgusting and caterpillars are less disgusting when compared to *Ascaris* worms (Curtis *et al.,* 2004). They also conclude due to health threat, female respondent showed higher sensitivity on disgust toward insects than male (Curtis *et al.,* 2004) which is in line with our findings. Compared to our earlier findings suggest spiders and scorpions are fearful by university students (Azil *et al.,* 2021) and did not support present finding. The possible reason for this is could be due to that majority of our sample are in adulthood and older adult that have more

knowledge and more contact to these insects than young adult did in our earlier studies.

In the current study, comparing age with fear and disgust showed that younger people with mental illness feel disgusted toward fire ant and earwigs which support the hypothesis suggested by Matchett and Davey (1991), who proposed that disgust sensitivity was related to fear-evoking animals. Fire ant and earwigs are known as small medium insects that evoke not only fear but also disgust due to relationship as predatory in nature (Reagan, 2019). Earwig has similar appearance with cockroaches and are associated with dirtiness that posed threat to health in human being (Fezer & Schmitz, 2012). The results of this study also showed difference between age and insect among normal healthy people; however, this difference was not significant.

Another important finding was that head lice, spiders, centipede, and sago larvae were rated as fearful insects by female in both groups compared to male. Bees, blister beetles, cockroaches, beetles, and giant water-bugs were also rated as fearful by female compared to male respondents in this study. These results are consistent with those of other studies and suggest that female is more fearful than men toward insects (Curtis *et. al.,* 2004; Polák *et. al.,* 2022; Prokop & Fančovičová, 2010). Gerdes and teams found that females showed high trait anxiety and were more fearful toward spiders and wasps than male support this finding (Gerdes *et al.,* 2009). According to Arrindell *et al.* (1999), although gender is a significant predictor for animal phobia, their differences are insignificant when compared between gender and disgust. Female showed higher sensitivity of disgust to disease threat than male (Curtis *et. al.,* 2004; Prokop & Fančovičová, 2010). It is also believed this difference was attributed to the notion of higher effort by females in protecting the next generation (Fessler & Navarrete, 2003). Female showed greater avoidance and have high repetitive negative thinking when distressed than men (Graham *et al.,* 2020) when exposed to disease or threat. Although some of the insects or arthropods are small creatures, they are dangerous and able produce venom as a defence mechanism to protect themselves from the perpetrator that could be other insects or human beings. The defence can be through bite with venom or saliva or fluid that ejected to perpetrator skin which can produce itchiness (Nishida & Tenorio, 1993) that may induce uncomfortable feeling after being bitten by those insects and enhance avoidance toward the insects.

One unanticipated finding from this study is employment as one of the factors that influence fear and disgust toward the insects. Surprisingly, head lice, a small insect, was deemed fearful among healthy students and employed people. However, the observed difference between employed people with mental illness towards fear of insects in this study was not significant. Head lice are tiny insects that feed on blood from a human scalp and produce sores and itchiness at the infected areas (Koch *et al.,* 2001). Australian residents rated disgust and anxiety as well as fear toward head lice (Parison *et al.,* 2013).

In terms of disgust, stink bugs were rated as disgusting insect by unemployed psychiatric patient while normal employed adult rated earwigs as disgusting insects. One possible explanation of stink bugs being rated by psychiatric patient is due to pungent smell (Krall *et. al.,* 1999; Nonaka, 2009). Although stinks bugs are seen as important for ecological environment and can be seen in attracted to light in houses or house windows, some types of predatory stink bugs bite human skins causing allergy or dermatitis (De Clercq, 2000). While earwigs are rated fearful by students and employed healthy people, sometimes people perceived earwigs as similar to cockroaches since both can fly and intrude on humans as they are attracted to light. Also, earwigs appear sleek, with sinuous body, secretive and have nocturnal habits (Fulton, 1924) and are seen as intimidating by humans. Those insects associated with the spread of disease, dirt, or contamination are considered disgusting and are avoided while dangerous insects are considered as fearful (Matchett & Davey, 1991). Moreover, based on the law of Similarity, objects that are physically similar to disgusting objects are deemed to be more disgusting (Olatunji *et al.,* 2017). These differences are also due to impact of cultural influence (Barrett, 2005), personality, cognitive factors, and perception (Thorpe & Salkovskis, 1995), human belief (Cronin-Jones, 1991) and lack of knowledge on insects (Rafael *et al.,* 2009).

This finding has important implications for developing an appropriate intervention and identifying fear and disgust toward insects. It is documented that exposure therapy has been found to reduce fear and danger perceptions toward

spiders. Exposure therapy, however, failed to reduce feeling of disgust toward insects (Berle, 2007; Mason & Richardson, 2012). Therefore, it is important to design specific interventions that can address fear and disgust toward insects. Furthermore, knowledge about insect should be disseminated to public of varying age group; this will educate and inform to reduce perception that insects are dangerous and create awareness about their benefits. This will increase information about the usefulness of insects as medicine and food such as providing source of protein, amino acid, and good digestion to human beings (Srivastava *et. al.,* 2009; Verkerk *et al.,* 2007).

Finally, several important limitations need to be considered for this current study. First, this study used a newly designed survey which is a subjective measure asking the participant to rate their fear and disgust toward insects. This study could not confirm whether that participant has any serious phobia or anxiety. A more structured clinical interview such as SCID or MINI is needed to determine whether the fear or disgust as found in this study is associated with phobia disorder. We also acknowledged that the small sample size may limit the generalisation of this finding to a larger population. We also perform study's based on cross-sectional methodology that prevents us from determining the casuality (Salehi *et al.,* 2022) and open to recall bias and external validity (Andrade, 2021; Aoun *et al.,* 2020) .

V. CONCLUSION

Returning to the question posed at the beginning of this study, it is now possible to state that there are different insects that evoke fear and disgust by healthy people and people with mental illness. Fear and disgust toward insects are due to perception that some insects are dangerous and harmful to human being. Knowledge about insects should be incorporated in the school education curriculum to educate about the nature of insects so that it will lessen fear toward the insects. This information also will help the clinician to be aware of the possible existence of fear and disgust toward insects among people with mental illness and clinical interview should be conducted to determine level and severity of phobia toward insects so that early intervention can be provided to help improve their quality of life.

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