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Identification of Induced Emotions of Different Waste Types through Motives in Predicting Disposal Decisions

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Abstract
Understanding the role of motives through induced emotions (IE) influence disposal decisions. Disgust, comfort, and justice are the affective motives in identifying consumers' induced emotions when determining waste disposal decision. The IEs for disgust, comfort and justice motives are disgusting, comfortable and shame. 452 participants were recruited in the between-subjects survey to examine how changes in forms and conditions of waste induce consumers' emotions when holding and littering different waste conditions. The result showed that consumers felt more disgusting holding used and altered conditions of most waste. However, consumers did not feel shame when they littered all types of waste.

1.0 Background

The issue of waste generation has received critical attention across the world. In 2016, an estimated 2.01 billion tonnes of municipal solid waste were generated, and the number is predicted to rise to 3.40 billion tonnes by 2050 if the situation continues (Kaza et al., 2018). The amount of waste generation across the world is varied, but the number is worrisome. For example, the East Asia and the Asia Pacific regions had the highest waste generation in 2016 (i.e., 468 million tonnes), and the Middle East and North Africa produced quite a tremendous amount of waste (i.e., 129 million tonnes) (World Bank, 2018).

A type of waste material that is particularly damaging at its end-of-life is plastic. It is the highest solid waste produced globally. In 2015, an estimated 6300 megatons of plastic waste had been produced, of which 12% was incinerated, 79% was dumped in landfills, and only around 9% was recycled. (Geyer et al., 2017) mentioned; that approximately 8 million tonnes of plastic is unethically disposed into the ocean, resulting in the diminishment of marine habitat. When plastic waste is exposed to high-temperature and long-term usage, hazardous chemicals could leak into seawater. The pollutant then reaches humans' bodies or is swallowed by marine life, making its way into complex food chains and consequently affecting the entire ecosystem (Kehinde et al., 2020). Therefore, instant but strategic actions are required to reduce plastic pollution. Horejs (2020) highlighted that a 5-year delay in implementing action would increase plastic waste by more than 300 million metric tons.

Litter is one of the primary sources of plastic waste. As reported by Kolodko et al. (2016), the UK government spent almost £1 billion in 2014 to solve the littering problem across the UK. Litter is defined as "anything that is dropped, tossed, abandoned, or deposited that caused defacement in public places (Environmental Act, 1990). The Clean Neighbourhoods and Environment Act of 2005 (CNEA, 2005) broadened the definition of litter to include anything dropped on private property, as well as rivers, ponds, and lakes. The' thrown away' stuffs includes smokers' materials, confectionery

packs, non-alcoholic drinks-related, fast food-related, snack packs, alcoholic drinks-related, vehicle parts, discarded food/drink, and plastic bags (Keep Britain Tidy, 2015).

Many reasons why people litter have also been studied. Mainly, littering is centred on people's attitudes or behaviour and infrastructural facilities. Factors that lead to improper waste disposal include the absence of bins within compounds, people's laziness, litter following the litter concept, and lack of education and awareness (E. Williams et al., 1997); (Campbell, 2007). However, there are also complex contextual factors that trigger littering behaviour. For example, littering occurred mostly during mealtimes – lunch and dinner and drunkenness during the night-time (Campbell, 2007).

There has been extensive research on how design can change or improve user behaviour (K et al., 2016), i.e., strategies for developing sustainable behaviour (Lilley, 2009), design tools for promoting appropriate behaviour (Lockton et al., 2010), and design dimensions to influence environmental behaviour (Zachrisson, 2014). Design for behaviour change frameworks, models or approaches have been utilised in various fields, such as safety, technology, energy-saving and health.

Different stakeholders, i.e., the government, environmental charities and educational institutions, have taken assertive strategies to alter people's littering behaviour (Keep Britain Tidy, 2015). The strategies include developing new and innovative anti-littering interventions, which include engaging with local communities and improving and executing enforcement regulations (Defra, 2017). However, prominent design strategies with psychological frameworks as the basis for solving litter problems are lacking. As highlighted by Defra (2017), design-based interventions could alter or change people's behaviour in reducing litter.

According to Aunger & Curtis (2013), the brain has three distinct kinds of human behaviour mechanisms. The first is the reactive behaviour mechanism. The mechanism gives a direct response to external stimuli that can affect a body's system. The second mechanism is planning behaviour, which allows the user to foresight their long-term projection. The third mechanism is motivated behaviour which produces goal-directed behaviour that occurs mostly on a day-to-day basis.

Motivated behaviour suggests that motives act as the trigger to goal-directed behaviour. Motives are psychological mechanisms that direct humans to perform essential daily tasks (Aunger & Curtis, 2013). Fifteen motives have been proposed by Aunger & Curtis: Lust, Hunger, Comfort, Fear, Disgust, Attract, Love, Nurture, Hoard, Create, Affiliate, Status, Justice, Play and Curiosity.

To date, there are limited studies exploring motives for changing users' behaviour. Research on understanding motives as behaviour change agents could potentially assist designers in developing new products, systems or service designs that prompt goal-directed behaviour. For instance, disgust motives have been demonstrated to provide knowledge on the perception contamination of plastic waste (Meng & Leary, 2021) and attract, disgust and nurture motives can prompt motivation on handwashing behaviour in Kenya (Aunger et al., 2010). The pillar of human motives is induced emotions (Daud, 2022). Hence, understanding the induced emotions when users deal with potential litter objects (waste) could offer essential insights into how to alter human goal-directed behaviour

2.0 Literature Review

2.1 Induced emotions in anti-littering interventions

Understanding the role of induced emotions such as guilt and pride in shaping everyday behaviour would substantially contribute to scholarly knowledge regarding the predictors of environmental behaviour (Bissing-Olson et al., 2016). If people believe that something they have done is moral and valued, they will feel proud of this behaviour. In contrast, if people believe that their behaviour is immoral and inappropriate, they are likely to feel guilty about this behaviour.

Positive and negative emotions could influence better engagement in environmentally-centred behaviour. For example, anticipated negative emotion, e.g., feeling angry or frustrated, could effectively stimulate individuals' environmental awareness by highlighting the harmful effects of environmental pollution (Meng-Chen & Chao-Chan, 2015). On the other hand, having positive feelings, such as optimism and happiness, has proven to be an important predictor of green product purchases (Koenig-Lewis et al., 2014). Also, feeling pride would lead to individuals' willingness to participate in environmentally-centred behaviour (Liang et al., 2019).

In educating consumers on how to dispose of their waste properly, designers have used various strategies, e.g. in posters and billboards, to induce emotions, which are expected to direct consumers' disposal decisions. For example, the 'Litter and You are Rubbish' poster (Figure 1) is intentionally designed to degrade those who litter by associating them with rubbish. Disgust feeling is triggered when people see this advertisement. On the other hand, the 'Is that what you expect to find in the sea?' poster is designed to prompt people to reflect that they are the contributors to plastic pollution in the ocean (Figure 2).

Figure 1: Litter and You're Rubbish poster
Source: Keep Australia Beauty

Figure 2: Is that what you expect to find in the sea?
Source: Ad Forum

2.2 Attributes of waste types and disposal decisions

Besides anti-littering campaigns on printed media, packaging design plays a role in environmental behaviour. Langley et al. (2011) viewed that packaging attributes could influence waste disposal. The design of the packaging should communicate to the consumers how to recycle or dispose of it properly. For instance, information on the pack should facilitate consumers on how to dispose of used packaging properly. For example, (1) consumers may feel disgusting when holding paper-based food packaging with left sauce residue. Therefore, they will directly litter the waste immediately. Or (2) consumers feel uncomfortable carrying a dented can drink after they finish their drinks and will be left on a bench in the public park. Furthermore, multiple attributes in the packaging design could influence consumers' disposal decisions, such as visual attributes (i.e., packaging shape), information attributes (i.e., information readability) and positioning of exterior elements (Langley et al., 2011).

By and large, visual and textual information on packaging provides cues on how to dispose of the waste properly. Trudel & Argo, (2013) claimed that consumers are likely to dispose of waste in the bin if the size or form of the products changes at the end of use phase consumption. Consumers also are influenced by the knowledge of how to clean the packaging before it can be recycled (Wikström et al., 2016). Typically, they are puzzled about their actions, whether they should clean the residue, e.g., (oil from food or leftover food) prior to disposing of the packaging.

2.3 Interaction motives and disposal decisions

Dirty, unpleasant, discomfort and disgust are emotions that consumers feel when provoked by dirty and disgusting stimuli. Disgust evolved as an emotion that avoids disease vectors, pathogen contamination and distaste food (Aunger & Curtis, 2013). According to Rozin & Fallon (1987), avoidance motivation was based on (1) rejection of sensory factors, (2) anticipation of harmful consequences, (3) inappropriate manner and (4) originality of food or items. For instance, rejection of sensory factors may originate from the bad taste or smell of food (i.e., rotten or expired food). Subsequently, twisted facial expressions with wrinkling of the upper nose and raising of the upper lip typically emerged when related disgust stimulus-evoked any individuals (Pochedly et al., 2012).

Hawkins (2001) narrated a situation of the rubbish scene, where a plastic shopping bag travelling around together with strong wind created unpleasant views and disgusting feelings. The phase switch of plastic from a convenient object to discarded waste have created a contaminated experience between plastics bag and consumers. Perceived contamination that occurs between consumers and plastic objects causes them to not be near the source (i.e., contaminated plastic) (Meng & Leary, 2021). Moreover, contaminated food packaging after consumption was usually littered and disposed of in the wrong bins for multiple reasons, such as hygienic issues (e.g., users will not recycle packaged raw meat because of the belief of treatment blood material) (Langley et al., 2011).

2.3.1 Disgust motive and contamination interaction

Feeling comfortable, relaxed, and pleasant are the stimulated emotions when individuals experience pleasure and practical interaction with objects or infrastructure. Commonly, these feelings were experienced in two different situations (1) while holding used objects and (2) while disposing of the user object.

However, alterations in the size and form of waste packaging could create uncomfortable feelings and influence how consumers dispose of the waste. Trudel et al. (2016) cited that product distortion influences intentions to recycle and the degree to which a product is considered typical of trash. Respondents in the study had significantly higher intentions to recycle a full sheet of paper (i.e., a large object) in comparison with a full sheet of paper that was crumpled into a ball or a small piece of paper (i.e., small objects). In another study conducted by Trudel et al. (2016), consumers were more likely to trash distorted objects. Nearly 80% of maintained-shape papers were recycled compared with only 10% of crumpled papers in the recycled bin.

Furthermore, Langley et al. (2011) pointed out that alterations of geometrical forms on waste transition routes could influence consumers to discard, recycle, re-use or compost their waste. Commenting on disposal intention, the authors argued that specific packaging formats, such as low quality, flat and rectangular formats with no secondary functions (i.e., re-use,) are likely to be discarded into the general waste stream. On the other hand, cylindrical packaging such as glass bottles and can drinsk are more likely to be recycled or re-used. Such findings strengthen the notion that changes in packaging attributes, such as shape, could lead to improper disposal of disposal intention.

2.3.2 Comfort motives and recycling cues

Interestingly, there is a concept called 'Litter influences litter'. Campbell (2007, noted that it was almost acceptable to drop litter when an area was already dirty and run down but not when it was tidy and presentable. Littering has activated descriptive norms (i.e., the perception of what most people approve of) in a given setting, triggering everyone else to litter (Cialdini et al., 1990). However, knowledge of how litterers' actions influence how others

perceive them is still limited. For instance, should the litterers feel shame, guilt or embarrassment when they litter? Or do they feel proud of performing the unethical behaviour?

2.4 Social motives and perceptions

According to Miller (2016), social motives are the psychological processes that drive people's thinking, feeling, and behaviour in interactions with other people. Because social situations confront people with the preferences and needs of others and not just their own, they require a broader perspective in which the interests of others are incorporated. Social motives reflect how people value these interests concerning their own. For example, the individual feels proud of his or her new appointment at work, or she feels shame when the incident has brought a bad reputation to her family. Emotions have been produced to drive behaviour to optimise social capital (Aunger & Curtis, 2013). Previous studies on moral emotions such as embarrassment, shame and guilt demonstrated that these emotions promote prosocial behaviour (Barón et al., 2018); (Bissing-Olson et al., 2016).

2.4.1 Justice motive inflicts punishment

In the context of 'litter influence litter', it is still unknown how justice motive through shame, guilt, and embarrassment mediate others' decision to litter. Shame, guilt, and embarrassment are induced emotions stimulated when individuals disapprove of wrongdoers. Guilt is an ethics-based emotion (Böhm, 2003) which results from an evaluation of subjects and individuals' actions concerning their values (Ortony et al., 1988). Sources that create guilt arises from negative perceptions of one's thought or actions. For instance, Andrew felt guilt when a ten-year-old girl accidentally saw him intentionally drop his used coffee cup under a bench in a park. However, feelings of guilt can prompt subsequent righteous behaviour, which would be more likely to exercise restraint, avoid self-indulgence and exhibit less prejudice.

Shame is one of the self-directed emotions (Rudolph & Tscharaktschiew, 2014). According to Merriam-Webster (2019), shame (noun) is a painful emotion caused by the consciousness of guilt, shortcomings, or impropriety. Shame is elicited given two conditions: (a) A person perceives herself as being uncontrollably defective or flawed, and (b) this state of affairs is perceived by others (Rudolph & Tscharaktschiew, 2014). Furthermore, shame and embarrassment are characterised by withdrawal and a tendency to hide (Rudolph & Tscharaktschiew, 2014)

3.0 Hypothesis

According to the previous literature, three hypotheses were developed to examine the induced emotions of consumers when holding and littering waste. The hypotheses are as follows:

1.) Disgust – People will feel more disgusting when holding used and altered waste as they would not want to have it close to them

2.) Comfort - Objects seen as more (less) comfortable to hold would be more (less) likely to be littered since they are seen as more difficult to hold

3.) Justice - Objects made more discreet through alterations are seen as more acceptable to litter. This is really about the punishment of
others

4.0 Research methodology

An online questionnaire approach was chosen to understand the relationship between disposal decisions and motives through induced emotions. The close-ended questionnaire design is particularly useful for assessing the relationship between induced emotion and disposal decisions (Bird, 2009). The author also cited that closed questions are easy to administer, easily coded and analysed, allow comparisons and quantifications, and they are more likely to produce fully completed questionnaires while avoiding irrelevant responses. Therefore, in the questionnaire, the close-ended types of questions design were chosen except for questions on an estimation of penalty fees.

In designing a good questionnaire, a conceptual framework is needed to examine (1) what is the research questions and (2) what is the 'independent' and 'dependent' variables the researcher plan to study (Jenn, 2006). Referring to the objective of this study, disgust, comfort, and justice from evolutionary theory (Aunger & Curtis, 2013) were adopted as the theoretical frameworks. Meanwhile, the induced emotions of each motive are adapted from the literature review. This investigation explores motives through induced emotions as dependent variables and disposal decisions (i.e., to hold or to litter) as independent variables.

4.1 Waste objects as stimuli

Seven common types of waste (refer to Table 1) were selected as the stimuli to examine the relationship between motives and disposal decisions. The stimuli were also tested in two different conditions, i.e., altered and unaltered conditions. For disgust motives, burger boxes, French fries' wrappers, and pudding cups were selected as samples. All objects were exposed to two different conditions, i.e., altered and unaltered. For instance, for disgust motives, two conditions of rice pudding have been displayed, which are (1) new and unopen and (2) open with residue. Next, for the burger box, ketchup (i.e., sauce) is the residue attached to the altered conditions.

Next, objects such as canned drinks, coffee cups, chip packaging, and cigarette butts are selected as samples for comfort motives. All objects were exposed to two different conditions, i.e., altered and unaltered. For instance, for comfort motives, two conditions of can drink have been displayed, which are (1) new and (2) dented can drink. Lastly, for the justice motive, the researcher focuses on how altered objects would be more acceptable to litter. This is regarding the punishment of others for littering and self-reflection in the case of other individuals littering.

Based on a study of packaging transformation by Weston et al. (2016), the seven common waste items were selected through "bin raids" in three locations on two separate days within a London, England, university campus. The study identified common features of these waste types for categorisation, such as altered shapes and recycled materials in the waste. Consequently, the focus of the study was specifically on common waste types with shape alterations.

Table 1: Seven waste objects with two different conditions (i.e., unaltered and altered)

Waste types	Cigarette	Burger box	Can drink	Chips packet	Coffee cup	Pudding cup	Fries wrapper
Unaltered							
Altered							

4.2 Sample size

Four hundred fifty-one participants in the study were recruited from around 65 million population in the United Kingdom (The World Bank, 2021). Krejcie & Morgan (1970) suggested that the required sample size for the United Kingdom population with a 95% confidence interval and 5% margin error is N: 384. Hence, the recruited participants have represented a sufficient sample size for this study. In addition, 55% of the participants are female, and 45% are male participants.

4.3 Measurement

Questions in the online questionnaires are divided into two types, which are (1) consumers' felt emotions (i.e., induced emotion) and (2) consumers' behavioural intention. Additionally, all questions are designed as closed-ended questions. Taherdoost (2019) cited that the Likert scale could measure the degree of agreement and disagreement about some attitude, object, person, or event. Hence, Likert-scale questions are proposed in this study to measure both questions, i.e., felt emotions and behavioural intention of consumers' when holding the objects. Furthermore, Likert scale questions are convenient for participants to digest and answer (Taherdoost, 2019).

4.4 Procedure

Questionnaires are distributed to the participants through Qualtric company. At the beginning of the questionnaires, participants were required to fill up their details such as gender, age, current residence (i.e., in the UK or otherwise) and smoking status.

At the beginning of the questionnaire, each participant is exposed to only one object (i.e., one waste type), either in altered or unaltered condition. Also, participants who are smokers will evaluate cigarette butt objects only. Hence, approximately thirty to forty participants of a total of 452 will evaluate different objects (e.g., can drink, French fries wrapper and burger box) either in altered or unaltered conditions. The distributions of participants according to objects are described in Table 2.

Table 2: Total number of seven waste objects with two different conditions (i.e., unaltered and altered)

Waste types (N)	Cigarette	Burger box	Can drink	Chips packet	Coffee cup	Pudding cup	Fries wrapper
Unaltered	38	31	31	29	32	33	33
Altered	37	33	31	31	31	31	30
Total	75	64	62	60	63	64	63

5.0 Result and discussion

The results demonstrate that users felt more disgusted and uncomfortable holding altered objects compared with unaltered objects. However, no significant differences were found when users observed others litter their waste. The details of the result and discussions are as follows:

Table 3: Summary of results for unaltered and altered conditions of seven waste objects

Waste types	Cigarette	Burger box	Can drink	Chips packet	Coffee cup	Pudding cup	Fries wrapper
Altered							
Unaltered							
Disgust	/	/	/	X	X	/	/
Comfort	/	/	/	X	X	/	/
Justice	X	X	X	X	X	X	X

Tabl

Table 4: Mann-Whitney U test results for unaltered and altered conditions of seven waste objects

No	Waste objects	Dependent variables	Unaltered N	Mean rank	Altered N	Mean rank	P-value
1	Cigarette	Disgust	38	31.93	37	43.2	*0.041
		Comfort		47.76		27.97	*0.001
		Justice		41.86		34.04	0.119
2	Coffee	Disgust	32	30.09	31	33.97	0.371
		Comfort		32.69		31.33	0.767
		Justice		31.27		32.76	0.741
3	Fries Wrapper	Disgust	33	25.35	30	39.32	*0.002
		Comfort		36.26		27.32	*0.053
		Justice		30.36		33.8	0.425
4	Burger box	Disgust	31	19.95	33	44.29	*0.001
		Comfort		37.74		27.58	*0.028
		Justice		31.05		33.86	0.532
5	Can drink	Disgust	30	40.79	31	22.21	*0.001
		Comfort		24.52		38.48	*0.002
		Justice		31.79		31.21	0.896
6	Chips	Disgust	30	27.91	31	32.92	0.255
		Comfort		34.74		26.53	0.068
		Justice		30.52		30.48	0.994
7	Pudding	Disgust	33	24.05	31	41.5	*0.001
		Comfort		39.68		24.85	*0.001
		Justice		32.08		32.96	0.847

*p<0.05

Disgust motive
A Man-Whitney U test was run to determine differences in disgusting feelings when holding altered and unaltered waste objects. As shown in Table 7.4, the result indicates that consumers felt more disgusting when holding all altered waste items except coffee and chips packets

Three waste items scored statistically higher mean rank different between feeling more disgusting when holding altered and unaltered objects waste objects, which were cigarettes, burger boxes and pudding cups. For instance, the mean rank for the altered pudding cup was significantly higher (mean rank= 41.5) than the mean for the unaltered (mean rank= 24.05). On the other hand, interestingly, consumers felt more disgusted when holding the unaltered can drink (mean rank= 40.79) compared with the altered can drink (mean rank= 22.21).

As mentioned in the literature review, disgust motive could influence disposal decisions if users interact with contaminated interaction. In addition, remaining leftovers, such as ketchup and rice pudding on the waste objects, have formed a sensory rejection, which leads to avoidance of interacting with the waste objects. However, there is no correlation between disposal decisions and waste objects without residues, such as chip packets and coffee cups. These may be explained because users could not anticipate harmful consequences when holding the mentioned waste objects.

Comfort motive
A Man-Whitney U test was run to determine differences in feeling more comfortable when holding unaltered and altered waste items. Referring to Table 7.4, the difference between feeling more comfortable when holding unaltered and altered waste objects was statistically significant for all waste objects; however, not significant for coffee cups (p: 0.767) and chip packets (p:0.068).

Pudding cups and cigarettes scored statistically higher mean rank when holding unaltered objects compared with altered waste objects. This can be illustrated briefly by referring to the mean rank of unaltered cigarettes (mean rank=47.76) and the mean rank of the altered cigarette butt (mean rak=27.97). In contrast to canned drinks, consumers felt more comfortable when holding the altered can drink (mean rank=38.48) compared with the unaltered drink (mean rank=24.52).

Users felt less comfortable holding the waste objects since they are more challenging to hold. The alterations in size and form of objects such as cigarettes and can drink do influence the disposal decisions. This result aligned with Trudel et al. (2016), where users are more likely to litter the distorted object.

Justice motive
A Man-Whitney U test was run to determine differences in justice motive when holding unaltered and altered waste objects. According to Table 7.3, consumers were not motivated by justice motive either when holding both conditions of waste objects. Furthermore, the seven waste objects scored p-value more than 0.05 and scored small differences in mean ranks between altered and unaltered conditions. The result indicates that users felt there were no moral responsibility issues when they observed others litter their waste objects. However, further studies are required since the intention to change other people's behaviour may be subject to cultural norms and local context.

6.0 Conclusions
The present study aimed to examine the role of motives in influencing disposal decisions. As mentioned in the literature review, induced emotion could potentially predict environmental behaviour. Therefore, seven common waste types in two different conditions (i.e., altered and unaltered) have been chosen as stimuli to understand users' disposal decisions.

The findings have indicated that disgust and comfort motives could influence disposal decisions. Shape and form alteration, for instance, dented can drink and half-cut cigarette butts, eventually could trigger disgusting and uncomfortable feelings and guide users to dispose of the waste. However, feeling punished, shame and being observed by others did not affect the disposal intentions of users when littering the seven waste objects. Interestingly, information attributes, for instance, recycling symbols in plastic packaging (e.g., rice pudding cup), did not influence users' disposal decisions.

The study shed light on motives and induced emotions' complexity in environmental behaviour. Designers could manipulate objects' packaging and visual, form, and information for better user-product interaction. Importantly, packaging that is well-designed to trigger relevant emotions has the potential to lead users to dispose of their waste correctly. With a focus on evolving consumer attitudes and sustainability concerns, this study could provide an analysis of how these factors shape the influence of motives on disposal decisions within the packaging industry. Considering the impact on consumption patterns and consumer behaviour, the knowledge of this study could be expanded to the development of a new business model focusing on environmentally conscious packaging design and the impact of sustainability messaging on disposal decisions. This could provide insights into how the research and development in the packaging industry can innovate new packaging according to consumption patterns and new shifts of research focusing on environmental impacts.

This study is bounded by certain limitations, notably the restriction to testing only common waste found within university environments, rather than encompassing waste encountered in public areas. Moreover, the study's geographical scope is confined to the UK, albeit with the potential for replication in diverse contexts, for instance, in the other developed and developing countries. Additionally, while the investigation primarily focused on exploring the influence of disgust as an emotional factor on waste disposal behaviors, future research endeavours could extend to an examination of other induced emotions, such as love, a sense of reward, and feelings of togetherness, to understand the dynamics shaping waste disposal decisions.

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